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REPORT ON THE WEATHER BUREAU RADIOMETEOROGRAPH PROGRAM

By L. T. SAMUELS
[Weather Bureau, Washington, D. C.]

Remarkable progress has been made in this country during the past 2 years in the development of radiometeorographs; at least 5 different types have been developed. In January 1937, when it was necessary for the Weather Bureau to decide on its program for the fiscal year beginning July 1, 1937, no one type had been sufficiently developed for regular use in scheduled observations. It was, therefore, deemed best to continue the study of all 5 types in order to explore more thoroughly the best features of each.

At the Central Office of the Weather Bureau in Washington, all of the various types of radiometeorographs are being used in an attempt to develop the most suitable calibration and receiving apparatus, evaluation methods, launching technique, etc. A specialist in radiometeorography has recently been added to the Central Office staff for this purpose.

The designers of the 5 types are: (1) H. Diamond and W. S. Hinman, Jr., and their collaborators of the National Bureau of Standards in cooperation with the Navy Department and Julien P. Friez and Sons, Inc.; (2) L. F. Curtiss and A. V. Astin of the National Bureau of Standards in cooperation with the Weather Bureau; (3) O. C. Maier and L. E. Wood of the California Institute of Technology; (4) K. O. Lange, A. E. Bent, and C. B. Pear, Jr., of Blue Hill Observatory, Harvard University; and (5) the Weather Bureau in cooperation with Julien P. Friez and Sons, Inc., Baltimore, Md.

Development was continued by Diamond and his collaborators on their instrument; and the Weather Bureau, again this fiscal year, transferred a sum of money to the National Bureau of Standards for continuing the development of the Curtiss and Astin type. With regard to the other three types of radiometeorographs, the Weather Bureau set up a program having a twofold objective: to maintain close contact between the manufacturer and the Weather Bureau personnel making the observations; and to operate a station far distant from the manufacturer.

In accordance with the program, daily radiometeorograph observations were begun at the Weather Bureau Airport Station, Burbank, Calif., September 1, 1937, and are to continue until June 30, 1938. The instruments used there are known as the Galcit type, developed at the California Institute of Technology. These meteorographs are calibrated by the contractor in Pasadena and are delivered to the Burbank station in small lots so that an instrument is available each day. The soundings are made, as nearly as practicable, at the same time as the airplane observations at San Diego Naval Air Station so that comparisons of the data can be made.

At the Boston Weather Bureau Airport Station, daily radiometeorograph observations were begun October 1, 1937, and are to continue until June 30, 1938. The Harvard type instrument developed at Blue Hill Observatory, is being used there. While close contact between the Bureau personnel and the contractor in Cambridge, Mass., is also possible at Boston, the arrangements there require the instruments to be calibrated by the Weather Bureau instead of by the contractor. This procedure was adopted in order to determine which plan might prove best for future policy. Prior to the discontinuance of the Army airplane observations at Boston on December 31, 1937, the radio soundings were made at the same time for comparison.

In connection with an investigation of the structure of polar continental air and the development of cold waves in North America, authorized under the Bankhead-Jones Act, the Weather Bureau made daily radiometeorograph observations at Fairbanks, Alaska, from October 7, 1937, to March 15, 1938. The instruments used there are known as the Weather Bureau type and are manufactured in Baltimore. They were shipped in monthly lots to Fairbanks, where they were calibrated by Bureau personnel. Under this plan, the practicability of transporting the instruments long distances and of using them under severe weather conditions was studied. Airplane observations were made at Fairbanks every third day during this period for comparison with the radiometeorograph data.

The observations are promptly evaluated and data for the meteorologically significant levels transmitted by radio to Washington, and to other stations, where they are charted and analyzed in conjunction with the regular aerological reports.

During the first 122-day period at Burbank, 97 radio meteorograph records were obtained; of these, 87 percent exceeded 5 km, 42 exceeded 10 km, and 13 exceeded 15 km. The maximum height attained at Burbank was 19.5 km.

During the first 92-day period at Boston, 77 radiometeorograph records were obtained; of these 87 percent exceeded 5 km, 25 exceeded 10 km, and 4 exceeded 15 km. The maximum height attained at Boston, was 22.2 km.

During the first 86-day period at Fairbanks, 60 radiometeorograph records were obtained; of these, 75 percent exceeded 5 km, 13 exceeded 10 km, and none reached 15 km. The maximum height attained at Fairbanks was 12.9 km.

In table 1 are shown the percentages obtained for differences of the temperatures indicated by the radiometeorographs from those shown by the airplane observations at the significant levels for the period of observation ending December 31, 1937. Because of the distance between Burbank and San Diego, the data below 1 km at these 2 stations were not included in this comparison. The figures in the upper left corners of the first columns for each station indicate the total number of cases on which the percentages are based.

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TABLE 1

	Burbank			Boston			Fairbanks		
	0°–1°	1°–2°	>2°	0°–1°	1°–2°	>2°	0°–1°	1°–2°	>2°
September	65	35	25	40					
October	116	35	22	43	178	21	25	54	46	37	11	52
November	107	31	22	47	173	45	26	29	39	39	10	51
December	139	27	30	43	128	37	28	35	58	26	24	50
Total	427	32	25	43	479	34	27	39	143	34	15	51

In table 2 are shown the percentages obtained for a comparison of relative humidities using the same method as for temperature. Humidity comparisons were made for temperatures above 0° C. only as well as for all temperatures.

TABLE 2

BURBANK

		0–5%	5–10%	10–15%	15–20%	20–25%	>25%
September:							
Above 0° C	58	31	33	24	7	5	0
All temperatures	68	31	34	24	7	4	0
October:							
Above 0° C	83	35	22	18	16	9	6
All temperatures	113	34	19	11	19	10	7
November:							
Above 0° C	72	28	28	22	12	3	7
All temperatures	106	28	24	23	12	5	8
December:							
Above 0° C	81	28	26	17	9	9	11
All temperatures	141	26	26	16	11	8	13
Total:							
Above 0° C	294	31	27	19	11	6	6
All temperatures	428	30	26	18	12	7	7

BOSTON

October:							
Above 0° C	63	41	29	8	11	3	8
All temperatures	147	34	23	17	15	3	8
November:							
Above 0° C	41	39	24	10	7	5	15
All temperatures	137	34	22	16	6	9	13
December:							
Above 0° C	4	75	0	25	0	0	0
All temperatures	120	29	14	18	9	8	22
Total:							
Above 0° C	108	52	18	14	6	3	7
All temperatures	404	32	20	17	10	7	14

FAIRBANKS

October:							
Above 0° C	15	20	20	20	20	7	13
All temperatures	34	18	23	20	18	9	12
November:							
Above 0° C	0						
All temperatures	36	50	14	19	6	3	8
December:							
Above 0° C	1	0	0	0	0	100	0
All temperatures	39	38	28	10	13	3	8
Total:							
Above 0° C	16	10	10	10	10	53	7
All temperatures	109	35	22	16	13	5	9

In figures 1, 2, and 3 are shown the temperature-altitude graphs for the last periods in December for which both airplane and radiometeorograph data were available for the three stations. The times (75th meridian) of launching are a. m. except where p. m. is indicated; the surface temperature is indicated and each abscissa interval corresponds to 10° C. The numbers adjacent to the curves are relative humidities.

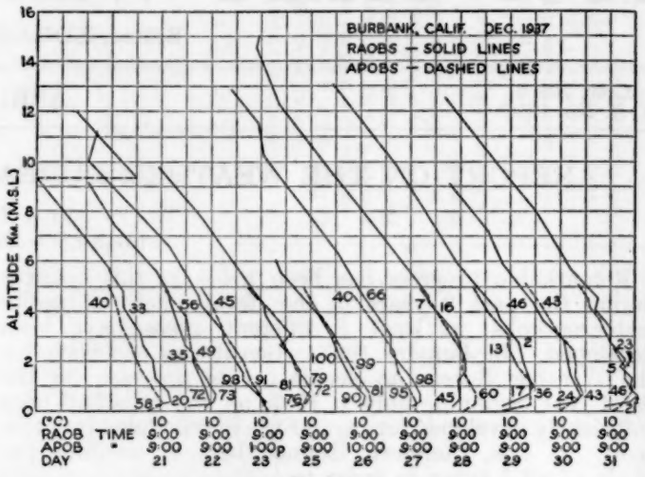


FIGURE 1.

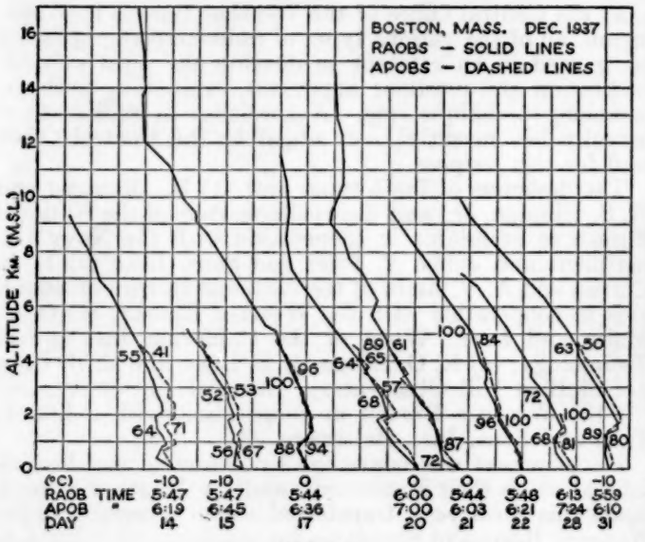


FIGURE 2.

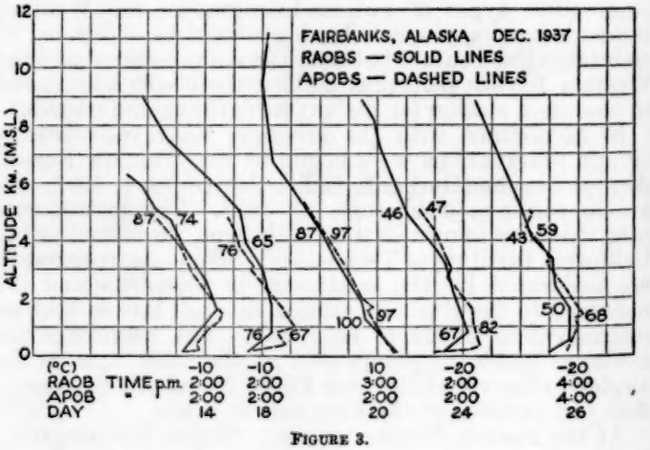


FIGURE 3.

Before conclusions can be drawn from these results, however, a number of factors must be taken into account.

These include: differences in the paths followed by the airplane and the balloon and therefore possibly even different air masses encountered; the limited experience of personnel in the technique of calibrating and of making regularly scheduled observations of this kind; differences in time, in some cases, between the airplane and radiometeorograph observations; differences in rate of ascent and lag of radiometeorograph and aerometeorograph; possible changes in the aerometeorograph since last calibration; and possible differences between the initial temperatures of the instruments.

It is planned in the near future to obtain comparisons by sending aloft the various types of radiometeorographs simultaneously from the same place, with recording, i. e., nonradio, meteorographs attached to the same balloon. This method of comparison is considered to be more reliable than the airplane observations used so far.

In view of the promising results being obtained with radiometeorographs and because of the great value of the observational data, it is planned to increase the number of stations to six next fiscal year. To do this, it will be necessary to replace airplane with radiometeorograph observations at some places, since additional funds were not made available for this work. An important factor in this connection, which should reduce the cost materially at favorably located stations, is the large percentage of instruments which will be found and returned. The percentages of recovery for some of the past sounding balloon series made in this country with recording meteorographs, i. e., the nonradio types, are given in table 3.

TABLE 3

Place	Number of observations	Percentage returned
Omaha, Nebr.	306	92
St. Louis, Mo.	115	94
Royal Center, Ind.	80	91
Dallas, Tex.	77	83
Ellendale, N. Dak.	64	91
Groesbeck, Tex.	44	84
Broken Arrow, Okla.	34	76
Huron, S. Dak.	26	92
Avalon, Calif.	23	65

With the experience which will be gained during the next fiscal year, it seems probable that most of the airplane observations will be replaced by radiometeorographs after June 1939.

It is desired to acknowledge the assistance of M. E. Crawford of the Aerological Division for drawing the graphs shown.

RECORD-BREAKING ANNUAL PRECIPITATION, 1846–1850

By LEON J. GUTHRIE

[Weather Bureau, Dayton, Ohio]

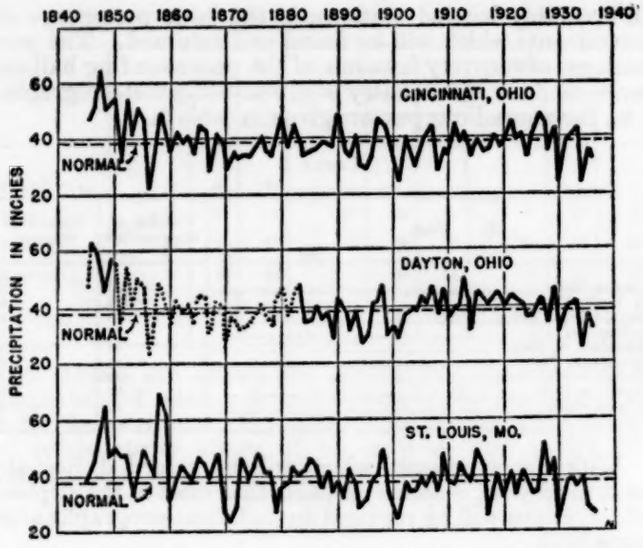
Available records for the years of 1846 to 1850 establish the fact that over limited areas of northeastern United States remarkably heavy annual precipitation must have occurred. For instance, southwestern Ohio experienced wetness that has never been approached since that time; a peak of 62.96 inches was recorded at Dayton during 1846 and 65.18 inches at Cincinnati during 1847. Correspondingly heavy precipitation apparently fell at points as far west as St. Louis, where 65.36 inches were recorded during 1848. A curious feature is the time lag of a year between the maximum amounts at each of the three stations. The similarity of these maximum figures tend to bear out the authenticity of the data, although gages or methods of measurements might have differed materially in those days. At Steubenville, Ohio, it is also to be noted that there was a surplus for which we find no equal in later records of southeastern Ohio.

Judging by graphs of all the above stations, not only did copious rains occur but the yearly variation was more erratic than it has ever been since. This condition lasted until about 1860; at least one bad drought is evident between 1850 and 1860. It is interesting to note that extreme positive departures for precipitation at the above stations were never offset by negative departures of equal or greater magnitude. One cannot reach any definite conclusions from the foregoing data because of the paucity of records prior to that time and the fact that nearby stations disagree in some of the main characteristics.

At Dayton the old record was kept at Cooper's Seminary, which is remembered as having had a good standard for educational work. Originally this old part of the record was omitted from precipitation charts as seemingly doubtful, but more recent studies indicate that it should be included. It is presented in the accompanying graph with missing years adapted from the Woodward High School record at Cincinnati. This is on the assumption that it gives a general idea of the trend for the missing years; the normal annual difference between Dayton and Cincinnati is only 0.69 inch.

The extremely wet years were preceded and followed by subnormal rains in 1845 and in 1851; thus, rain diagrams show a sharply defined positive area for the intervening years. At St. Louis precipitation decreased considerably after 1848 but increased again to the all time maximum of 68.83 inches in 1858. In eastern Ohio, and as far east as Pittsburgh, the years 1846 to 1850 reveal similar characteristics for precipitation except that the amounts are not nearly as excessive as in southwestern Ohio. Annual fluctuations were more marked subsequent to the early years mentioned and down to the year 1890. To the south, Springdale, Kentucky, showed an average excess for the period 1846 to 1850 of 5.33 inches. Much farther south, at New Orleans, rain was below normal within the wet interval, while as far east as Rochester, N. Y., it was just slightly in excess.

The above figures would serve to uphold the tradition that "it doesn't rain like it used to," at least for a few sections in the Northeastern States. For southwestern Ohio it looks as if back in the years 1846 to 1850 rain making forces within the atmosphere reached their maximum of recorded history. Annual amounts of 56 inches or more appear in the records as late as the year 1890, but after that they are exceeding rare. The accompanying graphs of precipitation at Dayton, Cincinnati, and St. Louis were taken from the *Climatic Summary of the United States*, 1930 edition.



Total annual precipitation (inches) 1845–51

Year	Dayton, Ohio	Cincinnati, Ohio	Portsmouth, Ohio	Marietta, Ohio	Steubenville, Ohio	Pittsburg, Pa.	Springdale, Ky.	St. Louis, Mo.	New Orleans, La.	Rochester, N. Y.
1845	[1]	46.38	40.05	33.90	38.44	31.89	43.28	37.99	54.43	34.44
1846	62.96	53.52	45.39	46.27	52.21	47.79	47.80	45.45	67.29	37.13
1847	59.93	65.18	48.30	52.30	57.28	46.22	50.12	52.72	53.51	36.14
1848	45.58	50.58	41.14	43.18	50.25	34.14	58.36	65.36	53.40	32.03
1849	56.37	52.97	43.26	42.89	47.32	34.81	45.27	45.71	52.52	32.87
1850	[2]	54.76	57.20	52.36	46.98	37.41	67.10	50.50	51.13	38.49
1851	[3]	31.70	50.97	34.94	28.59	29.64	42.34	46.84	50.11	24.97
Average 1846–50	[4]56.21	55.40	47.06	47.40	50.81	40.07	53.73	51.95	55.57	35.33
Official averages to 1930	37.86	38.55	41.06	42.25	41.15	35.91	48.40	37.44	57.35	33.23

[1] Partial record; below average, 7 months.
[2] Partial record; above average, 7 months.
[3] Partial record; below average, 9 months.
[4] 4-year average.

NOTES AND REVIEWS

JOHN A. LAPP, et al. *Meteorology as a career.* The Institute for Research. Chicago. 1938.

This 24-page booklet is designed to aid individuals, who are concerned with the problem of choosing a career, in reaching a decision with regard to a career in meteorology. The booklet opens with a few introductory paragraphs on the definition, delimitations, history, and description of the science of meteorology. This is followed by a few paragraphs on the Weather Bureau: its history; a summary of its functions and services; and a list of its positions including their salary ranges. The processes involved preliminary to making the official weather forecast and the duties of the personnel at a district forecast center are then reviewed. Private concerns and Government agencies other than the Weather Bureau are mentioned as employers of meteorologists and climatologists, while the practical restriction of the field to male employees is emphasized. The particular importance of and the duties involved in the application of meteorology to airline operation are considered in some detail. The personal and educational qualifications desired in meteorologists are stated and some of the opportunities awaiting the qualified few are indicated. Brief comments are made relative to the duties and salaries of meteorological positions in the Canadian service. As a further aid to those interested in meteorology as a career, a list of meteorological associations, periodicals, and suggested readings is added.

The booklet, which is 8½ by 11 inches, is bound in a heavy brown-paper cover and is priced at $1.—*Charles M. Lennahan.*

BIBLIOGRAPHY

[RICHMOND T. ZOCH, *in Charge of Library*]

By AMY D. PUTNAM

RECENT ADDITIONS

The following have been selected from among the titles of books recently received as representing those most likely to be useful to Weather Bureau officials in their meteorological work and studies:

Bowman, Isaiah.
Limits of land settlement; a report on present-day possibilities. New York, Council on foreign relations. [c1937]. vii, 380 p. maps (1 fold.). 24-½ cm.

Eisenlohr, Roland, & others.
Flugtechniches Handbuch. Berlin, Leipzig. 1936. Band IV. Atmosphäre, Wetter. Physikalische und technische Tabellen. Ballone und Luftschiffe. illus., diagrs. 22½ cm.

Fellows, Jennie Dorcas.
Cataloging rules, with explanations and illustrations, prepared by Dorcas Fellows, instructor in advanced cataloging, New York state library school. 2d ed., rev. and enl. New York, H. W. Wilson company, 1926. xv, 303 p. illus. 26 cm. Based on the A. L. A. catalog rules.

French, Thomas Ewing.
A manual of engineering drawing for students and draftsmen. 5th ed., rev. and enl. New York & London. 1935. xii, 481 p. illus. (incl. plans), diagrs. 23½cm. "Bibliography of allied subjects": p. 434–439.

Grober, Julius.
Die Akklimatisation, eine Untersuchung über ihre Bedingungen, ihre Fehlschläge und ihre erfolgreiche Führung. Jena. 1936. 156 p. 25½ cm.

King, Horace Williams.
Handbook of hydraulics for the solution of hydraulic problems. 1st ed. New York. 1918. xvi, 424 p. incl. tables, diagrs. fold. diagr. 17½ cm.

Lake-carriers' association.
Annual report. 1937. Detroit. 1938. plates, ports., maps, 24 cm. 176 p. "Weather bureau service," p. 160–161.

U. S. Geological survey.
Surface water supply of the United States, pt. vi. Missouri river basin. 1936. Washington. 1938. plates, maps, etc. 23 cm. (Its Water-supply paper 806.)

SOLAR OBSERVATIONS

[Meteorological Research Division, EDGAR W. WOOLARD in charge]

SOLAR RADIATION OBSERVATIONS, APRIL 1938

By IRVING F. HAND

Measurements of solar radiant energy received at the surface of the earth are made at eight stations maintained by the Weather Bureau, and at nine cooperating stations maintained by other institutions. The intensity of the total radiation from sun and sky on a horizontal surface is continuously recorded (from sunrise to sunset) at all these stations by self-registering instruments; pyrheliometric measurements of the intensity of direct solar radiation at normal incidence are made at frequent intervals on clear days at three Weather Bureau stations (Washington, D. C., Madison, Wis., Lincoln, Nebr.) and at the Blue Hill Observatory of Harvard University. Occasional observations of sky polarization are taken at the Weather Bureau stations at Washington and Madison.

The geographic coordinates of the stations, and descriptions of the instrumental equipment, station exposures, and methods of observation, together with summaries of the data obtained up to the end of 1936, will be found in the MONTHLY WEATHER REVIEW, December 1937, pp. 415 to 441; further descriptions of instruments and methods are given in Weather Bureau Circular Q.

Table 1 contains the measurements of the intensity of direct solar radiation at normal incidence, with means and their departures from normal (means based on less than 3 values are in parenthesis). At Madison and Lincoln the observations are made with the Marvin pyrheliometer; at Washington and Blue Hill they are obtained with a recording thermopile, checked by observations with a Marvin pyrheliometer at Washington and with a Smithsonian silver disk pyrheliometer at Blue Hill. The table also gives vapor pressures at 8 a. m. (75th meridian time) and at noon (local mean solar time).

During April 1938 direct solar radiation intensities averaged below normal at Washington and above normal at Madison, Lincoln, and Blue Hill.

Table 2 contains the average amounts of radiation received daily on a horizontal surface from both sun and sky during each week, their departures from normal and the accumulated departures since the beginning of the year. The values at most of the stations are obtained from the records of the Eppley pyrheliometer recording on either a microammeter or a potentiometer.

During April 1938 all stations showed an excess in the total solar and sky radiation with the exception of Washington and the two California stations, Fresno and Riverside.

Polarization measurements made at Madison on 6 days give a mean of 54.4 percent with a maximum of 61.5 percent on the 9th. Both these values are below the corresponding normals for the month.

TABLE 1.—*Solar radiation intensities during April 1938*

[Gram-calories per minute per square centimeter of normal surface]

WASHINGTON, D. C.

Date	Sun's zenith distance									
	8 a. m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	Noon
	75th mer. time	Air mass									Local mean solar time
		A. M.					P. M.				
	e	5.0	4.0	3.0	2.0	*1.0	2.0	3.0	4.0	5.0	e
	mm.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mm.*
Apr. 11	3.99	0.73	0.84	0.98	1.12	1.41					2.26
Apr. 13	7.29				0.81						5.56
Apr. 14	8.48		.43	.57	.84						7.29
Apr. 19	8.81		.84	.98	1.22	1.49					6.02
Apr. 20	9.47			.89	1.08						8.48
Apr. 23	3.30			1.09	1.24	1.50					2.74
Apr. 25	5.13			.60	.86						5.79
Apr. 26	9.14						0.84				8.81
Apr. 27	10.59						.96				12.24
Apr. 28	11.38			.53	.73						12.68
Means		(.73)	.70	.81	.99	1.47	(.90)				
Departures		+.03	−.08	−.08	−.08	−.04	−.18				

MADISON, WIS.

Apr. 4	2.06					1.58					1.52
Apr. 9	2.74		1.12	1.27	1.38	1.60					2.36
Apr. 12	5.36			.79	.99						6.02
Apr. 18	7.87		.95	1.10	1.30	1.55					4.37
Apr. 20	3.99					1.56					4.75
Apr. 22	3.63			1.21	1.38	1.56					3.45
Apr. 27	8.47			.88	1.04						12.24
Apr. 30	4.95			1.22	1.39	1.60					2.87
Means			(1.04)	1.11	1.25	1.58					
Departures			+.11	+.07	+.05	+.13					

LINCOLN, NEBR.

Apr. 1	1.96							1.19			1.88
Apr. 2	2.06	1.00	1.10	1.25	1.44	1.61	1.38	1.18	1.05	0.93	1.68
Apr. 4	3.15					1.50					2.87
Apr. 8	2.74						1.36	1.18	1.02		2.74
Apr. 9	3.63	.95	1.07	1.20	1.36	1.59	1.33	1.13	0.98	.88	3.05
Apr. 10	4.17	.89	1.01	1.16	1.28	1.45					4.57
Apr. 11	7.87		.40	.51	.75	1.54	1.31	1.10	.98	.86	5.56
Apr. 12	5.16	.88	.98								4.57
Apr. 17	7.04	.71	.79	.98	1.20	1.48					7.57
Apr. 18	7.57			1.08	1.26						9.14
Apr. 20	4.95	.31	.43	.60	1.02	1.49					3.81
Apr. 21	6.27					1.56	1.37	1.20	1.06	.97	3.99
Apr. 22	3.81	.83	.98	1.14	1.31	1.53					3.81
Apr. 25	10.59						1.01	.87	.70	.59	14.10
Apr. 28	5.56						1.22	1.05	.90	.76	7.04
Apr. 29	7.57				.98	1.46					10.97
Apr. 30	10.21						1.16	.95	.79	.68	7.87
Means		.80	.84	1.00	1.18	1.52	1.27	1.09	.94	.81	
Departures		+.08	+.01	+.03	−.01	+.06	+.10	+.14	+.12	+.12	

BLUE HILL, MASS.

Apr. 1	8.2			1.12	1.29	1.38	1.19				4.8
Apr. 3	2.4				1.25	1.54	1.45	1.06			2.0
Apr. 7	2.6					1.43	1.25	1.15	1.02		2.2
Apr. 11	1.6			1.14	1.25	1.42	1.17				2.5
Apr. 16	4.4		0.96	1.12	1.28	1.44	1.26	1.08	.94		5.8
Apr. 17	4.2				1.30	1.45					3.2
Apr. 19	10.4			1.00	1.21	1.32					8.8
Apr. 20	6.8				1.17	1.29	.95				6.3
Apr. 21	7.4					1.38					6.8
Apr. 24	4.4				1.21	1.39	1.17				7.1
Apr. 26	6.3				1.17	1.25	1.08				7.1
Apr. 27	6.8				1.07	1.20	1.08				7.9
Apr. 28	9.9					1.27	1.06				6.5
Means			(.96)	1.10	1.22	1.37	1.17	1.10	(.98)		
Departures			+.01	−.00	+.03	−.02	+.04	+.07	+.05		

*Extrapolated.

TABLE 2.—*Average daily totals of solar radiation (direct+diffuse) received on a horizontal surface*

Week beginning—	Washington	Madison	Lincoln	Chicago	New York	Fresno	Fairbanks	Twin Falls	La Jolla	Miami	New Orleans	Riverside	Blue Hill	San Juan	Friday Harbor	Ithaca	Newport
	Gram-calories per square centimeter																
	cal.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*
Apr. 2	189	405	392	222	262	542	385	437	566	469	351	525	432	613	389	178	420
Apr. 9	436	430	527	462	391	524	333	381	534	420	414	451	437	633	399	356	471
Apr. 16	263	428	521	446	402	615	409	532	502	531	390	512	437	704	426	282	441
Apr. 23	512	349	476	391	504	499	452	507	495	511	451	377	490	674	580	502	591
	Departures of daily totals from normals																
Apr. 2	−188	+36	−16	−62	−57	+27	+52	+6	+48	+4	−19	+28	+60	+44	+78	−72	------
Apr. 9	+27	+26	+82	+114	+69	−50	−43	−6	+45	−50	+18	−42	+75	+33	+101	+84	------
Apr. 16	−177	+29	+67	+104	+34	+15	+20	+57	+14	+53	−25	−12	+47	+55	+11	0	------
Apr. 23	+42	−80	+37	+36	+86	−73	+41	+3	−33	+33	+59	−111	+14	+48	+67	+48	------
	Accumulated departures since Jan. 1																
	−5,674	−3,353	−1,092	+1,288	+490	−2,674	+2,352	−4,398	−133	−721	+2,695	−1,589	+56	+3,750	+5,026	+3,647	------

POSITIONS AND AREAS OF SUN SPOTS

[Communicated by Capt. J. F. Hellweg, U. S. Navy (Ret.), Superintendent, U. S. Naval Observatory. Data furnished by the U. S. Naval Observatory in cooperation with Harvard and Mount Wilson Observatories. The difference in longitude is measured from the central meridian, positive west. The north latitude is positive. Areas are corrected for foreshortening and are expressed in millionths of the sun's visible hemisphere. The total area for each day includes spots and groups]

Date	Eastern standard time	Mt. Wilson group No.	Heliographic: Diff. in longitude	Heliographic: Longitude	Heliographic: Latitude	Area: Spot or group	Area: Total for each day	Spot count	Observatory
1938	h m		°	°	°				
Apr. 1	9 25	5831	−68.0	273.2	−22.0	388	-------	7	Mount Wilson.
		5830	−65.0	276.2	−27.0	194	-------	1	
		5829	−58.0	283.2	+20.0	48	-------	4	
		5832	−57.0	284.2	+16.0	24	-------	1	
		5834	−21.0	320.2	+8.5	16	-------	2	
		5833	−16.0	325.2	−18.0	12	-------	1	
		5826	−9.5	331.7	−21.0	291	-------	19	
		5828	+39.5	20.7	−20.0	48	-------	5	
		5818	+68.0	49.2	−17.0	630	-------	10	
		5818	+85.0	56.2	−13.0	339	1,990	-------	
Apr. 2	9 23	5837	−78.0	250.0	−9.0	242	-------	1	Do.
		5831	−55.0	273.0	−22.0	388	-------	8	
		5830	−52.0	276.0	−27.5	194	-------	2	
		5832	−43.0	285.0	+18.0	36	-------	3	
		5829	−40.5	287.5	+21.0	24	-------	5	
		5836	−40.0	288.0	+9.0	16	-------	2	
		5826	+5.0	333.0	−20.0	291	-------	11	
		5835	+13.0	341.0	−27.0	6	-------	1	
		5818	+82.0	50.0	−17.0	436	1,633	2	
Apr. 3	12 26	5838	−71.0	242.1	+13.0	24	-------	1	U. S. Naval.
		5837	−62.5	250.6	−9.0	218	-------	2	
		5831	−40.0	273.1	−21.5	291	-------	16	
		5830	−37.0	276.1	−27.0	121	-------	2	
		5832	−29.0	284.1	+18.5	12	-------	3	
		5829	−24.5	288.6	+20.0	24	-------	2	
		5836	−24.0	289.1	+9.5	24	-------	2	
		5826	+19.5	332.6	−20.0	242	956	9	
Apr. 4	11 3	5838	−59.5	241.2	+12.5	36	-------	3	Do.
		5837	−49.5	251.2	−9.0	194	-------	2	
		5831	−27.0	273.7	−22.0	267	-------	13	
		5830	−25.0	275.7	−27.0	145	-------	2	
		5832	−13.0	287.7	+18.0	48	-------	2	
		5836	−11.0	289.7	+9.5	12	-------	2	
		5829	−11.0	289.7	+20.0	24	-------	2	
		(1)	+9.0	309.7	−11.5	12	-------	1	
		5833	+25.0	325.7	−17.0	24	-------	1	
		5826	+31.0	331.7	−20.0	194	956	3	
Apr. 5	11 8	5840	−81.0	206.4	−6.0	194	-------	2	Do.
		5839	−52.5	234.9	−7.0	24	-------	6	
		5837	−37.0	250.4	−9.0	194	-------	1	
		5831	−13.0	274.4	−22.0	242	-------	28	
		5830	−12.0	275.4	−27.0	97	-------	2	
		5832	−2.5	284.9	+18.0	48	-------	9	
		5826	+44.0	331.4	−20.0	242	-------	9	
		(1)	+47.5	334.9	+17.0	12	1,053	1	
Apr. 6	14 15	5840	−69.0	203.5	−7.0	339	-------	4	Mount Wilson.
		5839	−38.0	234.5	−7.0	97	-------	2	
		5837	−22.0	250.5	−9.0	194	-------	1	
		5831	+1.0	273.5	−23.0	194	-------	3	
		5830	+2.0	274.5	−28.0	73	-------	1	
		5836	+16.0	288.5	+10.0	145	-------	4	
		5826	+60.0	332.5	−20.0	291	1,333	5	

POSITIONS AND AREAS OF SUN SPOTS—Continued

Date	Eastern standard time	Mt. Wilson group No.	Heliographic: Diff. in longitude	Heliographic: Longitude	Heliographic: Latitude	Area: Spot or group	Area: Total for each day	Spot count	Observatory
1938	h m		°	°	°				
Apr. 8	12 14	5842	−71.0	176.2	+28.0	970	-------	10	Mount Wilson.
		5840	−44.0	203.2	−7.5	582	-------	35	
		5839	−13.0	234.2	−7.0	48	-------	2	
		5837	+4.5	251.7	−10.0	194	-------	2	
		5831	+27.0	274.2	−23.0	24	-------	2	
		5830	+29.0	276.2	−28.0	61	-------	3	
		5836	+43.0	290.2	+9.5	36	-------	3	
		5826	+85.0	332.2	−23.0	291	2,206	3	
Apr. 9	15 12	5844	−86.0	146.4	−12.0	436	-------	1	U. S. Naval.
		5843	−83.0	149.4	−24.5	582	-------	2	
		5842	−56.0	176.4	+28.0	1,454	-------	16	
		5840	−29.0	203.4	−7.0	388	-------	20	
		5839	+2.0	234.4	−6.5	48	-------	5	
		5837	+19.5	251.9	−9.0	194	-------	3	
		5830	+41.0	273.4	−28.0	121	3,223	1	
Apr. 10	11 41	5844	−74.0	147.1	−11.0	339	-------	3	Do.
		5843	−71.0	150.1	−22.0	679	-------	2	
		5842	−45.0	176.1	+27.5	1,261	-------	14	
		5840	−16.0	205.1	−7.0	388	-------	18	
		5837	+30.0	251.1	−9.5	145	-------	1	
		5830	+52.0	273.1	−28.0	73	-------	1	
		5845	+56.5	277.6	−32.0	36	2,921	2	
Apr. 11	11 3	5843	−69.0	139.3	−21.0	48	-------	2	Do.
		5843	−59.5	148.8	−23.0	630	-------	3	
		5844	−60.0	148.3	−11.0	436	-------	1	
		5842	−33.0	175.3	+27.0	1,164	-------	15	
		5840	−2.0	206.3	−6.0	339	-------	11	
		5837	+44.0	252.3	−10.0	145	-------	2	
		5830	+66.0	274.3	−27.5	73	2,835	1	
Apr. 12	11 18	5844	−47.0	147.9	−11.0	388	-------	2	Do.
		5843	−46.5	148.9	−22.0	679	-------	3	
		5842	−19.0	175.9	+27.0	1,164	-------	12	
		5846	+7.0	201.9	+7.5	48	-------	2	
		5840	+12.0	206.9	−6.0	339	-------	15	
		5837	+58.0	252.9	−10.0	145	-------	1	
		5830	+79.0	273.9	−28.0	24	2,787	1	
Apr. 13	11 9	5843	−33.0	148.8	−23.0	630	-------	8	Do.
		5844	−33.0	148.8	−10.5	388	-------	2	
		5842	−6.0	175.8	+27.0	1,115	-------	27	
		5846	+20.0	201.8	+8.0	97	-------	10	
		5840	+28.0	209.8	−5.0	242	-------	14	
		5837	+70.0	251.8	−10.0	97	2,569	2	
Apr. 14	11 8	5848	−88.0	80.6	−11.0	388	-------	2	Do.
		5847	−33.0	135.6	−7.0	12	-------	2	
		5843	−20.5	148.1	−23.0	630	-------	35	
		5844	−20.0	148.6	−10.5	388	-------	18	
		5842	+8.0	176.6	+27.0	1,018	-------	52	
		5846	+33.0	201.6	+8.0	73	-------	12	
		5840	+44.0	212.6	−5.0	218	-------	9	
		5837	+85.0	253.6	−10.0	97	2,824	2	
Apr. 15	11 3	5848	−76.0	79.5	−10.5	582	-------	9	Do.
		5852	−72.0	83.5	+26.0	48	-------	3	
		5851	−38.0	117.5	+16.0	24	-------	4	
		5843	−9.0	146.5	−23.5	582	-------	30	
		5844	−7.5	148.0	−10.5	388	-------	25	
		5842	+18.0	173.5	+27.0	824	-------	48	

POSITIONS AND AREAS OF SUN SPOTS—Continued

Date	Eastern standard time	Mt. Wilson group No.	Heliographic: Diff. in longitude	Heliographic: Longitude	Heliographic: Latitude	Area: Spot or group	Area: Total for each day	Spot count	Observatory
1938	h m		°	°	°				
Apr. 15	11 3	5850	+23.0	178.5	−24.0	36		3	U. S. Naval.
		5842	+30.0	185.5	+25.5	61		2	
		5846	+46.0	201.5	+9.0	24		6	
		5849	+53.0	208.5	+13.0	36		2	
		5840	+58.0	213.5	−5.0	218	2,823	6	
Apr. 16	13 0	5853	−80.0	61.2	−13.0	388		4	Mount Wilson.
		5854	−70.0	71.2	−9.0	97		2	
		5848	−61.0	80.2	−10.5	630		21	
		5843	+6.0	147.2	−23.0	582		28	
		5844	+9.0	150.2	−10.5	242		27	
		5842	+32.0	173.2	+27.0	727		30	
		5850	+37.0	178.2	−24.0	36		7	
		5842	+46.0	187.2	+25.0	61		30	
		5840	+72.0	213.2	−5.0	218	2,981	3	
Apr. 17	9 15	5853	−69.0	61.1	−13.0	533		14	Do.
		5854	−68.0	62.1	−8.0	97		4	
		5848	−52.0	78.1	−10.5	776		53	
		5843	+18.0	148.1	−24.0	582		43	
		5844	+20.0	150.1	−11.0	242		21	
		5842	+44.0	174.1	+27.0	727		58	
		5842	+48.0	178.1	+25.0	61			
		5850	+48.0	178.1	−25.0	36		6	
		5840	+85.0	215.1	−5.0	97	3151	1	
Apr. 18	11 50	5853	−58.0	57.4	−13.0	776		25	Do.
		5854	−53.0	62.4	−8.5	73		2	
		5848	−36.0	79.4	−10.5	873		70	
		5856	−25.0	90.4	−17.0	36		4	
		5843	+31.0	146.4	−24.0	630		25	
		5844	+34.0	149.4	−11.0	242		9	
		5842	+57.0	172.4	+27.0	436		27	
		5855	+63.0	178.4	−8.0	36		6	
		5850	+64.9	179.4	−25.0	6	3108	2	
Apr. 19	10 58	5857	−70.0	32.7	+12.0	48		2	U. S. Naval.
		5854	−38.0	64.7	−8.5	61		2	
		5853	−53.5	49.2	−16.0	121		2	
		5853	−41.0	61.7	−12.0	630		11	
		5848	−24.0	78.7	−10.0	776		15	
		5856	−11.0	91.7	−17.0	36		10	
		5843	+43.0	145.7	−23.0	582		11	
		5844	+48.0	150.7	−10.0	145		2	
		5842	+63.0	165.7	+32.0	48		1	
		5842	+78.0	180.7	+27.0	291	2738	1	
Apr. 20	11 30	5857	−56.0	33.2	+12.0	12		3	Do.
		5853	−40.0	49.2	−16.5	73		1	
		5853	−27.0	62.2	−13.0	582		17	
		5854	−25.0	64.2	−8.5	61		3	
		5848	−10.0	79.2	−10.0	679		28	
		5858	+49.0	138.2	−3.0	16		3	
		5843	+57.0	146.2	−23.0	436		9	
		5844	+60.0	149.2	−9.0	97		3	
		5842	+79.0	168.2	+32.0	48	2004	1	
Apr. 21	11 0	5853	−28.5	47.7	−16.5	73		5	Do.
		5853	−15.0	61.2	−13.0	630		8	
		5854	−12.0	64.2	−9.0	61		1	
		5848	+3.0	79.2	−10.0	679		20	
		5859	+41.5	117.7	+19.0	36		5	
		5843	+69.0	145.2	−24.0	388		3	
		5844	+70.0	146.2	−10.0	48	1915	1	
Apr. 22	9 51	5862	−85.0	338.7	+8.0	194		1	Mount Wilson.
		5863	−84.0	339.7	−11.0	194		2	
		5861	−17.5	46.2	+9.0	48		3	
		5853	−16.0	47.7	−17.0	97		27	
		5853	−3.0	60.7	−13.0	533			
		5854	+0.5	64.2	−9.0	48		2	
		5848	+15.0	78.7	−10.5	582		19	
		5859	+59.0	120.7	+19.5	48		8	
		5843	+81.0	144.7	−25.0	291	2035	1	
Apr. 23	10 27	5865	−78.0	332.1	−18.5	121		1	U. S. Naval.
		5863	−71.0	339.1	−10.5	242		4	
		5862	−69.5	340.6	+9.0	194		1	
		5864	−63.0	347.1	+13.0	48		4	
		5853	−2.0	48.1	−17.0	73		1	
		5853	+13.0	63.1	−13.0	485		11	
		5854	+15.0	65.1	−9.0	36		2	
		5848	+29.0	79.1	−10.0	533		17	
		5859	+70.0	120.1	+19.5	12	1744	2	
Apr. 24	10 33	5865	−65.0	331.9	−19.0	194		2	Do.
		5863	−58.0	338.9	−10.0	242		4	
		5862	−55.0	341.9	+8.5	194		2	
		5864	−52.0	344.9	+13.0	242		20	
		5853	−11.0	47.9	−17.0	61		9	
		5853	+25.0	61.9	−13.0	388		12	
		5848	+43.0	79.9	−10.0	485	1806	20	
Apr. 25	11 11	5865	−51.0	332.3	−19.0	121		1	Do.
		5863	−44.0	339.3	−10.0	194		4	
		5862	−40.0	343.3	+9.0	194		2	
		5864	−37.0	346.3	+12.0	242		18	
		5853	+25.0	348.3	−16.0	61		1	
		5853	+40.0	63.3	−13.0	436		3	
		5854	+39.5	62.8	−10.0	12		1	
		5848	+57.0	80.3	−9.5	485	1745	6	

POSITIONS AND AREAS OF SUN SPOTS—Continued

Date	Eastern standard time	Mt. Wilson group No.	Heliographic: Diff. in longitude	Heliographic: Longitude	Heliographic: Latitude	Area: Spot or group	Area: Total for each day	Spot count	Observatory
1938	h m		°	°	°				
Apr. 26	10 46	5868	−87.0	283.3	−20.0	194		1	U. S. Naval.
		5867	−85.0	285.3	−27.0	388		3	
		5865	−38.0	332.3	−19.0	97		2	
		5863	−30.0	340.3	−10.0	218		10	
		5862	−29.0	341.3	+9.0	194		4	
		5864	−24.0	346.3	+12.0	388		25	
		5866	−7.5	2.8	+24.0	24		5	
		5853	+38.0	48.3	−16.0	48		1	
		5853	+52.0	62.3	−13.0	291		2	
		5848	+71.0	81.3	−9.0	485	2327	3	
Apr. 27	11 4	5870	−87.0	209.9	−30.5	48		1	Do.
		5868	−77.0	279.9	−20.0	145		3	
		5869	−76.0	280.9	+24.5	97		1	
		5867	−71.0	285.9	−27.0	388		4	
		5865	−25.0	331.9	−19.0	73		1	
		5863	−15.0	341.9	−10.0	97		9	
		5862	−15.0	341.9	+10.0	194		1	
		5864	−10.0	346.9	+13.0	388		11	
		5866	+4.0	0.9	+24.0	73		7	
		5853	+50.5	47.4	−16.0	36		1	
		5853	+68.0	64.9	−13.0	291		1	
		5848	+88.0	84.9	−10.0	97	1927	1	
Apr. 28	11 2	5872	−79.0	264.8	−22.0	145		3	Do.
		5871	−78.0	265.8	+23.0	242		2	
		5870	−71.0	272.8	−30.0	97		3	
		5867	−69.0	274.8	−25.0	48		2	
		5868	−62.0	281.8	−19.0	339		2	
		5869	−62.0	281.8	+25.0	291		2	
		5867	−59.0	284.8	−27.5	485		11	
		5865	−12.0	331.8	−19.0	73		4	
		5863	−1.0	342.8	−9.0	97		12	
		5862	−0.5	343.3	+9.0	194		7	
		5864	+2.0	345.8	+13.0	388		20	
		5866	+19.0	2.8	+24.0	97		9	
		5853	+66.0	49.8	−15.0	24		1	
		5853	+80.0	63.8	−13.0	291	2811	2	
Apr. 29	11 13	5872	−67.0	263.4	−22.0	194		8	Do.
		5871	−62.0	268.4	+25.0	291		4	
		5870	−59.5	270.9	−30.0	61		2	
		5867	−54.0	276.4	−25.0	16		2	
		5868	−48.0	282.4	−20.0	291		4	
		5869	−47.5	282.9	+25.0	242		2	
		5867	−45.0	285.4	−27.5	388		8	
		5865	+1.0	331.4	−19.5	61		3	
		5862	+12.5	342.9	+9.5	194		2	
		5863	+15.0	345.4	−10.0	48		4	
		5864	+16.5	346.9	+13.0	388	2174	12	
Apr. 30	15 33	5872	−59.0	255.8	−22.5	24		2	Do.
		5872	−50.0	264.8	−22.0	194		7	
		5871	−47.0	267.8	+25.0	194		4	
		5870	−44.0	270.8	−30.0	61		4	
		5867	−38.0	276.8	−25.0	16		1	
		5869	−33.0	281.8	+24.5	339		3	
		5868	−32.0	282.8	−20.0	170		12	
		5867	−29.5	285.3	−28.0	291		8	
		5865	+17.0	331.8	−19.0	61		1	
		5862	+29.0	343.8	+9.5	194		1	
		5864	+31.0	345.8	+13.0	291	1835	13	

Mean daily area for 29 days=2221.

PROVISIONAL SUNSPOT RELATIVE NUMBERS FOR APRIL 1938

[Dependent alone on observations at Zurich and its station at Arosa]

[Data furnished through the courtesy of Prof. W. Brunner, Eidgen, Sternwarte, Zurich, Switzerland]

April 1938	Relative numbers	April 1938	Relative numbers	April 1938	Relative numbers
1	83	11	*a* 110	21	*b* 89
2	*ad* 81	12	97	22	*a* 75
3	80	13	*Mc* 119	23	*Ecddd* 82
4	80	14	*b* 115	24	*a* 95
5	*d* 93	15	*d* 117	25	*Ec* 92
6	*a* 97	16	*aad* 133	26	*d* 92
7	*d* 97	17	110	27	*dd* 124
8	*a* 88	18	112	28	*ad* 144
9	*d* 88	19	100	29	144
10	*d* 106	20	99	30	105 ?

Mean: 30 days=101.6.

a=Passage of an average-sized group through the central meridian.
b=Passage of a large group or spot through the central meridian.
c=New formation of a group developing into a middle-sized or large center of activity: E, on the eastern part of the sun's disk; W, on the western part; M, in the central circle zone.
d=Entrance of a large- or average-sized center of activity on the east limb.

AEROLOGICAL OBSERVATIONS

[Aerological Division, D. M. LITTLE in Charge]

By LOYD A. STEVENS

Mean free-air data, based on airplane weather and radiometeorograph observations during the month of April 1938, are given in table 1, which includes the basic elements of barometric pressure, temperature and relative humidity at various standard geometric heights. "Means", which have been computed by the customary method of differences, are not given where there are less than 15 observations at the surface or less than 5 at a standard height, except those standard heights within the layer of the monthly vertical range of the tropopause, for which 15 observations are also required. (For further details, see Aerological Observations in the January 1938 MONTHLY WEATHER REVIEW.)

Chart I shows that the mean *surface* temperatures during April were slightly above normal over the greater portion of the country; subnormal temperatures being confined, in general, to the States of Oklahoma, Texas, Louisiana, and southern Mississippi. The highest mean free-air temperatures for the month occurred over Kelly Field, Tex., at 0.5 and 1 kilometer and at 2.5 and 3 kilometers. At 1.5 and 2 kilometers, the highest temperatures occurred over El Paso, Tex., and at 4 and 5 kilometers over Pensacola, Fla. The lowest mean free-air temperatures for the month occurred over Sault Ste. Marie, Mich., at all levels. In general, the mean free-air temperatures for April were higher than for March; the greatest increase occurring over Spokane, Wash., at 5 kilometers where the value for April (−17.2° C) was 10.7° C higher than that for March (−27.9° C). At Kelly Field, Tex., at all levels and at Barksdale Field, La., Maxwell Field, Ala., and Pensacola, Fla., below 3 kilometers, however, the mean temperatures for April were lower than for March; the greatest decrease (−3.3° C) occurring over Kelly Field at 1 kilometer.

Isobaric charts constructed from the mean barometric pressures in table 1, were characterized by a statistical center of low pressure over Fargo, N. Dak., in the lower levels and over Sault Ste. Marie, Mich., in the higher levels. The highest mean pressures occurred over Pensacola, Fla., except that at 4 and 5 kilometers equally high pressure prevailed over Kelly Field, Tex. There was a marked increase, at all levels, in the mean free-air pressure over the northern part of the country for April as compared with March, resulting in a decrease in the south to north pressure gradient across the country.

Free-air resultant winds, based on pilot-balloon observations made near 5:00 a. m. (75th meridian time), are shown in table 2. For the most part the mean resultant wind directions for the month were remarkably close to the normal at nearly all stations and at all levels. The most outstanding variation from the normal occurred over Key West, Fla., between 1.5 and 3 kilometers, where the resultant directions at the successive standard levels for the current month were 106°, 73°, 165°, and 60° as compared with the normal directions of 172°, 222°, 244° and 272°, respectively. Over Pensacola, the resultant directions for the current month at 1, 1.5, and 2 kilometers were 124°, 156° and 199°, respectively, as compared with the normal directions of 237°, 259° and 284°. Over Medford, Oreg., at 4 kilometers the current resultant direction was 200° as compared with the normal for that level of 256°. Resultant velocities were near to or above normal over most stations in the lower levels and over the Lake region at all levels. Below normal resultant velocities occurred, however, over the northwest portion of the country up to 3 kilometers and along the Atlantic Coast at all levels. The greatest positive departure from normal (+4.9 m. p. s.) occurred over Chicago, Ill., at 3 kilometers and the greatest negative departure (−3.4 m. p. s.) occurred over Key West, Fla., at 4 kilometers.

Table 3 shows the maximum free-air wind velocities and their directions for various sections of the United States during April, as determined by pilot-balloon observations. The extreme maximum for the month was 61.7 meters per second from the NNW at 8,860 meters above sea level over Albuquerque, N. Mex.

TABLE 1.—*Mean free-air barometric pressure (P) in mb., temperature (T) in °C., and relative humidities (R. H.), in percent, obtained by airplanes or radiometeorographs during April 1938*

Stations	Altitude (meters) mean sea level																											
	Surface				500			1,000			1,500			2,000			2,500			3,000			4,000			5,000		
	Number of obs.	P	T	R. H.	P	T	R. H.	P	T	R. H.	P	T	R. H.	P	T	R. H.	P	T	R. H.	P	T	R. H.	P	T	R. H.	P	T	R. H.
Barksdale Field, La.[1] (52 m)	27	1,011	15.3	87	958	15.0	72	903	12.4	71	851	10.7	64	801	8.5	58	754	6.7	48	709	4.3	42	626	−1.5	38			
Billings, Mont.[2] (1,090 m)	29	892	4.9	67							848	5.6	61	798	3.0	59	749	−0.4	62	704	−3.7	64	618	−9.9	65	543	−16.9	62
*Boston, Mass.[3] (5 m)	24	1,017	6.4	76	958	6.0	73	901	4.6	70	847	1.8	68	796	−0.6	66	748	−2.7	66	702	−5.1	66	617	−10.0	61	542	−15.9	58
Cheyenne, Wyo.[3] (1,873 m)	29	810	2.0	77										798	3.9	67	749	2.5	56	704	−0.6	50	620	−8.2	53	544	−15.3	49
Coco Solo, C. Z.[3] (15 m)	29	1,009	25.0	82	955	22.6	88	902	19.8	82	851	16.9	78	802	14.9	68	755	13.2	54	712	10.9	50	630	5.8	40	557	0.3	36
El Paso, Tex.[1] (1,194 m)	30	880	12.9	29							849	14.7	26	800	11.8	25	752	8.6	26	708	4.9	27	625	−2.5	31	550	−9.7	31
Fargo, N. Dak.[3] (274 m)	30	982	1.7	76	955	3.5	71	898	2.5	64	843	0.5	63	792	−2.0	63	743	−4.4	62	698	−7.1	61	612	−12.2	57	537	−18.0	54
Kelly Field, Tex.[1] (206 m)	26	993	17.4	74	960	16.0	75	904	13.2	78	852	12.0	68	803	11.1	54	755	9.3	41	711	6.2	39	628	0.1	34	554	−7.6	32
Lakehurst, N. J.[3] (39 m)	24	1,015	8.0	78	959	9.8	59	902	7.4	54	848	5.1	52	798	2.2	54	750	−0.3	50	704	−4.1	51	618	−10.7	44	543	−17.7	42
Maxwell Field, Ala.[1] (52 m)	24	1,014	15.2	80	962	14.9	57	906	11.8	59	853	8.9	56	803	6.9	46	755	5.4	40	710	4.0	30	627	−1.9	24	552	−8.7	23
Mitchel Field, N. Y.[1] (29 m)	27	1,014	7.0	81	959	8.4	61	902	7.0	59	848	4.6	58	798	2.6	57	749	0.7	54	704	−1.4	50	620	−6.8	44			
Nashville, Tenn.[3] (180 m)	29	996	12.5	75	959	14.2	66	903	11.5	69	850	8.6	71	800	5.9	68	752	3.6	61	707	1.7	52	624	−4.1	46	549	−10.9	43
Norfolk, Va.[3] (10 m)	21	1,019	12.9	80	961	14.7	49	906	12.5	47	853	9.2	51	802	6.2	54	754	3.1	53	709	0.4	44	624	−5.4	36	549	−12.7	34
Oakland, Calif.[2] (2 m)	30	1,018	10.4	85	959	9.8	75	903	9.6	58	850	7.3	54	800	5.0	49	751	2.4	46	706	−0.2	46	621	−6.4	46	547	−13.2	48
Oklahoma City, Okla.[3] (391 m)	28	969	11.8	83	956	13.6	74	902	13.1	63	849	11.9	56	800	9.7	47	752	7.2	41	708	4.0	40	624	−2.9	43	550	−10.1	45
Omaha, Nebr.[1] (300 m)	30	979	8.4	73	955	9.1	65	900	7.7	60	847	5.5	59	796	3.4	58	747	1.2	54	703	−1.4	56	618	−7.0	54	544	−13.7	53
Pearl Harbor, T. H.[3] (6 m)	30	1,017	21.2	76	960	20.0	73	906	17.0	77	854	14.6	75	805	12.9	61	757	11.9	46	713	10.4	34	632	6.3	24	559	1.0	21
Pensacola, Fla.[3] (13 m)	26	1,019	15.8	83	962	15.6	65	907	12.7	58	854	10.4	54	804	8.7	46	756	7.3	39	711	5.4	29	628	0.6	20	554	−4.8	19
St. Thomas, V. I.[3] (8 m)	30	1,017	24.7	67	961	19.8	78	906	16.0	82	854	12.7	80	805	10.7	74	757	10.3	56	713	8.3	49	631	3.5	36	558	−1.5	29
Salt Lake City, Utah[2] (1,288 m)	30	870	6.8	63							848	9.2	49	798	6.8	47	750	3.3	50	705	−0.2	56	620	−6.4	62	546	−13.1	57

See footnotes at end of table.

TABLE 1.—*Mean free-air barometric pressure (P) in mb., temperature (T) in °C., and relative humidities (R. H.), in percent, obtained by airplanes or radiometeorographs during April 1938*—Continued

Stations	Altitude (meters) mean sea level																											
	Surface				500			1,000			1,500			2,000			2,500			3,000			4,000			5,000		
	Number of obs.	P	T	R. H.	P	T	R. H.	P	T	R. H.	P	T	R. H.	P	T	R. H.	P	T	R. H.	P	T	R. H.	P	T	R. H.	P	T	R. H.
San Diego, Calif.[3] (10 m)	26	1,016	12.7	83	958	11.9	82	902	10.7	72	849	9.4	59	800	7.0	52	752	5.2	46	706	2.8	42	623	−3.2	36	549	−10.9	34
Sault Ste. Marie, Mich.[3] (221 m)	26	991	1.2	78	957	0.9	73	899	−0.6	68	844	−3.0	65	792	−5.1	63	742	−6.9	60	697	−8.8	56	611	−14.0	55	535	−19.4	54
Scott Field, Ill.[1] (135 m)	26	1,001	9.3	82	958	11.7	62	902	9.5	62	848	6.7	62	798	4.6	58	750	2.5	52	705	0.0	46	621	−5.8	39	546	−13.3	44
Seattle, Wash.[3] (10 m)	22	1,019	12.3	69	960	8.5	72	904	6.1	67	850	3.3	61	799	0.6	56	750	−2.0	50	704	−4.6	46	620	−10.3	47	----	----	----
Selfridge Field, Mich.[1] (177 m)	19	994	7.5	81	957	9.2	70	900	7.3	69	847	4.5	69	796	1.8	66	748	−0.4	58	703	−2.8	60	618	−8.3	59	543	−14.0	49
Spokane, Wash.[3] (597 m)	30	946	4.9	85	----	----	----	901	8.0	58	848	5.3	56	797	1.7	59	748	−1.9	63	703	−4.9	62	617	−10.9	61	541	−17.2	57
Washington, D. C.[3] (13 m)	26	1,018	9.9	77	960	12.2	53	904	9.8	51	851	6.7	54	800	3.7	56	752	0.8	52	707	−1.7	45	622	−7.7	40	547	−13.9	36
Wright Field, Ohio[1] (244 m)	26	988	8.7	77	958	11.0	65	902	8.7	66	849	6.1	69	798	3.5	66	750	1.5	51	705	−0.6	41	621	−6.1	43	546	−11.9	43
*Burbank, Calif.[3] (220 m)	30	989	9.2	82	957	11.6	73	902	10.5	63	849	9.0	52	799	7.2	46	752	5.2	39	707	2.8	36	625	−3.0	31	550	−9.7	28
Chicago, Ill.[3] (187 m)	29	994	7.0	78	956	7.6	64	900	5.4	63	846	2.9	61	795	0.6	58	746	−1.3	54	701	−3.7	51	616	−9.2	46	541	−15.6	49
LATE REPORT FOR MARCH 1938																												
Pearl Harbor, T. H.[3] (6 m)	311,017	21.2	81	960	19.9	79	906	17.1	85	854	14.8	84	804	13.0	76	757	11.5	61	713	9.4	52	631	4.7	37	557	−0.8	27		

Observations taken about 4 a. m. 75th meridian time, except by Navy stations along the Pacific coast and Hawaii where they are taken at dawn.
*Observations by radiometeorograph. Stations not so marked have observations by airplane.

[1] Army.
[3] Weather Bureau.
[3] Navy.

NOTE.—None of the means included in this table are based on less than 15 surface or 5 standard-level observations.

TABLE 2.—*Free-air resultant winds (meters per second) based on pilot-balloon observations made near 5 a. m. (E. S. T.) during April 1938*

[Wind from N=360°, E=90°, etc.]

Altitude (meters) m. s. l.	Albuquerque, N. Mex. (1,554 m)		Atlanta, Ga. (309 m)		Billings, Mont. (1,095 m)		Boston, Mass. (15 m)		Cheyenne, Wyo. (1,873 m)		Chicago, Ill. (192 m)		Cincinnati, Ohio (157 m)		Detroit, Mich. (204 m)		Fargo, N. Dak. (283 m)		Houston, Tex. (21 m)		Key West, Fla. (11 m)		Medford, Oreg. (410 m)		Nashville, Tenn. (194 m)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
	°		°		°		°		°		°		°		°		°		°		°		°		°	
Surface	299	1.4	263	0.6	318	1.4	314	1.7	287	3.4	226	0.6	218	0.3	240	1.4	13	1.2	122	0.8	94	2.7	319	0.9	183	1.0
500	----	----	232	3.5	----	----	306	6.0	----	----	242	4.7	236	4.1	256	5.7	91	0.9	177	3.9	107	6.0	309	0.7	224	5.6
1,000	----	----	237	3.3	----	----	302	4.9	----	----	264	7.1	254	8.1	268	8.7	339	3.1	235	2.6	104	3.7	236	0.5	240	6.5
1,500	----	----	243	3.2	269	2.4	277	6.1	----	----	263	8.5	256	10.6	267	8.7	321	6.1	242	3.8	106	1.4	183	1.9	249	6.7
2,000	273	4.0	232	2.2	285	2.0	276	7.7	290	5.1	273	9.7	262	11.8	276	9.3	319	7.0	261	4.9	73	0.3	225	2.9	248	7.7
2,500	275	5.2	281	4.1	289	3.7	280	8.7	289	7.8	276	11.7	268	10.6	274	10.7	317	9.6	270	5.7	165	1.0	235	2.5	267	8.0
3,000	268	5.9	269	6.1	285	6.0	285	8.9	287	6.7	296	14.2	267	10.2	290	9.4	322	11.2	271	5.0	60	1.0	253	3.1	268	8.6
4,000	266	8.6	287	5.8	300	8.8	294	8.6	285	8.9	----	----	----	----	----	----	----	----	----	----	255	1.6	200	3.4	----	----
5,000	276	9.9	----	----	279	8.6	----	----	267	6.9	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

Altitude (meters) m. s. l.	Newark, N. J. (14 m)		Oakland, Calif. (8 m)		Oklahoma City, Okla. (402 m)		Omaha, Nebr. (306 m)		Pearl Harbor, Territory of Hawaii[1] (68 m)		Pensacola, Fla.[1] (24 m)		St. Louis, Mo. (170 m)		Salt Lake City, Utah (1,294 m)		San Diego, Calif. (15 m)		Sault Ste. Marie, Mich. (198 m)		Seattle, Wash. (14 m)		Spokane, Wash. (603 m)		Washington, D. C. (10 m)	
	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity	Direction	Velocity
	°		°		°		°		°		°		°		°		°		°		°		°		°	
Surface	294	1.2	247	0.9	178	1.3	177	0.5	53	4.2	94	1.6	212	0.9	178	2.4	279	0.4	42	0.7	162	1.1	120	0.9	301	0.7
500	283	4.6	288	2.6	182	5.1	220	1.7	70	6.9	114	3.6	229	4.7	----	----	315	1.4	117	1.1	159	1.3	----	----	293	4.7
1,000	291	6.2	320	4.2	215	9.9	251	3.8	77	7.6	124	2.2	230	7.7	----	----	334	3.3	273	2.9	197	1.0	213	2.2	291	6.5
1,500	271	7.0	513	3.7	237	7.6	269	5.5	79	6.1	156	1.7	266	7.6	170	2.9	333	3.7	289	4.0	215	3.2	242	2.7	283	8.0
2,000	273	9.4	301	4.0	253	6.7	281	6.5	94	4.0	199	0.9	276	8.7	192	1.9	319	4.0	288	5.1	228	1.8	247	3.4	284	9.8
2,500	274	11.1	297	3.8	257	6.7	300	7.4	87	1.9	249	2.6	272	8.2	228	2.4	312	5.6	281	6.7	243	2.8	248	4.3	274	8.9
3,000	273	8.5	299	5.1	272	6.8	296	8.8	61	1.1	280	3.5	276	8.7	251	3.3	318	7.7	282	5.6	254	2.6	251	5.2	270	9.3
4,000	----	----	272	7.2	286	8.0	300	13.4	84	1.3	286	7.3	297	9.6	239	5.2	315	8.0	300	9.4	----	----	249	7.1	284	9.1
5,000	----	----	262	10.1	291	6.8	----	----	----	----	----	----	----	----	263	5.9	306	7.7	----	----	----	----	244	8.2	----	----

[1] Navy stations.

TABLE 3.—*Maximum free-air wind velocities (meters per second) for different sections of the United States based on pilot-balloon observations during April 1938*

Section	Surface to 2,500 meters (m. s. l.)					Between 2,500 and 5,000 meters (m. s. l.)					Above 5,000 meters (m. s. l.)				
	Maximum velocity	Direction	Altitude (m), m. s. l.	Date	Station	Maximum velocity	Direction	Altitude (m), m. s. l.	Date	Station	Maximum velocity	Direction	Altitude (m), m. s. l.	Date	Station
Northeast [1]	42.9	SW	1,740	3	Pittsburgh	44.6	WSW	3,420	1	Albany	40.8	WNW	7,360	7	Albany.
East-Central [2]	36.0	NW	1,410	10	Richmond	38.2	W	5,000	1	Nashville	44.6	WSW	5,500	1	Nashville.
Southeast [3]	36.0	S	1,580	8	Tampa	38.4	W	4,980	3	Charleston	42.0	W	6,240	4	Charleston.
North-Central [4]	35.3	WNW	930	20	Bismark	40.6	NNW	4,430	22	Sault Ste. Marie	43.7	W	6,590	6	Sault Ste. Marie.
Central [5]	36.3	WNW	1,540	3	Chicago	36.0	WNW	4,120	4	Indianapolis	42.0	NW	8,350	22	Moline.
South-Central [6]	39.0	WNW	990	8	Houston	39.6	W	4,150	2	Vicksburg	33.6	WNW	5,890	3	Amarillo.
Northwest [7]	26.2	W	2,310	18	Spokane	33.9	WSW	3,170	18	Spokane	37.8	NW	8,820	6	Pendleton.
West-Central [8]	46.6	S	2,360	25	Rock Springs	43.4	S	2,510	25	Rock Springs	56.0	NNW	8,780	6	Modena.
Southwest [9]	32.1	W	2,370	15	El Paso	41.6	SSW	5,000	26	Albuquerque	61.7	NNW	8,860	6	Las Vegas.

[1] Maine, Vermont, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, and northern Ohio.
[2] Delaware, Maryland, Virginia, West Virginia, southern Ohio, Kentucky, eastern Tennessee, and North Carolina.
[3] South Carolina, Georgia, Florida, and Alabama.
[4] Michigan, Wisconsin, Minnesota, North Dakota, and South Dakota.
[5] Indiana, Illinois, Iowa, Nebraska, Kansas, and Missouri.
[6] Mississippi, Arkansas, Louisiana, Oklahoma, Texas (except El Paso), and western Tennessee.
[7] Montana, Idaho, Washington, and Oregon.
[8] Wyoming, Colorado, Utah, northern Nevada, and northern California.
[9] Southern California, southern Nevada, Arizona, New Mexico, and extreme west Texas.

RIVERS AND FLOODS

[River and Flood Division, MERRILL BERNARD in charge]

By BENNETT SWENSON

Following a relatively wet March in most sections of the country from the Appalachians westward, scattered sections received excessive rainfall during April. The heaviest amounts occurred in the central portions of Mississippi, Alabama, and Georgia, over the middle Missouri and upper Mississippi Basins, and in portions of Texas and Louisiana.

Moderately heavy rains over portions of the Mississippi-Alabama-Georgia area on April 1–2, were followed by heavy rains on April 6–8. The excessive rainfall resulted in severe floods, particularly in the Alabama, Tombigbee, Pascagoula, and Pearl River systems.

The official in charge, Montgomery, Ala., reports on the flood in the Alabama River as follows:

On the morning of April 7 moderate rains were reported in the upper watersheds and moderately heavy to heavy rains below Gadsden, Ala., to Montgomery.

Very little rain fell during the day of the 7th, but during the night and on the morning of the 8th, very heavy downpours occurred. The averages for 2 days were approximately 5.00 inches, fairly evenly distributed in the drainage basin above Gadsden, and 7.90 below, with the mean of all stations equal to 6.59 inches. Several stations in the only really flashy portion of the Coosa River basin reported torrential rainfall, 11.79 inches at Clanton; 9.65 at Leeds; and 9.37 at Goodwater. Also reported were 8.81 inches at Union Springs and 12.69 at Selma.

Critical situations had developed over night at Rome, Ga., and Wetumpka, Ala., with 7 a. m. stages on the 8th of 25.0 feet at Rome and 53.7 feet at Wetumpka. It is believed that the operation, by the Alabama Power Co., of its dams reduced somewhat the crest at Montgomery.

Due either to a change in channel conditions or to unusual behavior of backwater, the crest discharge of approximately 210,000 second-feet at Montgomery gave only a 54.2-foot stage in this flood against 56.9 for identically the same peak discharge in the 1929 flood.

Heavy rainfall occurred over the Black Warrior and Tombigbee River basins at several periods during the latter half of March and the first 2 days of April and was followed by unusually heavy rains on April 6–9. The rainfall in the latter period ranged from 5 inches in Black Warrior basin to 13 inches or more in the Tombigbee watershed south of Demopolis, Ala.

The Black Warrior reached a stage of 63.0 feet at Tuscaloosa, Ala., on April 8. The Tombigbee River crested at all of the locks south of Demopolis 4 days before it crested at Demopolis. This is not the usual procedure as floods to the south of Demopolis, in large rises, come from the Black Warrior and Little Tombigbee Rivers through Demopolis. At locks 1 and 2 the excessive rainfall caused stages that were unprecedented for rainfall in the lower Tombigbee.

The following report on the floods in the Pascagoula and Pearl Rivers was prepared by the official in charge, Meridian, Miss.:

Heavy rains were reported at intervals over the entire Meridian district during the latter part of March. Pearl River was above the flood stage at Jackson, Miss., and Pearl River, La., at the beginning of April. Heavy rains were again reported over most of the district on April 1 and 2, again during the 6th to 8th, and a period of moderate to heavy rains from the 17th to the 20th. The rains were more or less spotted as shown by the following table of monthly amounts of rainfall for April at the various river and rainfall stations:

Station	Rainfall (Inches)	Station	Rainfall (Inches)
Bay Springs, Miss.	12.63	Jackson, Miss.	10.13
Collins, Miss.	12.72	Leakesville, Miss.	4.44
Columbia, Miss.	9.93	Meridian, Miss.	16.44
Dlo, Miss.	15.06	Merrill, Miss.	5.16
Edinburg, Miss.	9.00	Monticello, Miss.	14.21
Enterprise, Miss.	16.98	Pearl River, La.	3.92
Franklinton, La.	6.30	Pelahatchee, Miss.	9.56
Hattiesburg, Miss.	7.06	Philadelphia, Miss.	10.20
Hickory, Miss.	18.08	Shubuta, Miss.	18.70

The total monthly precipitation at Meridian for April, 16.44 inches, was 11.66 inches above the normal. It is the greatest amount of precipitation for April in some 50 years of record and has been equalled or exceeded twice, namely, 18.77 inches in January 1937, and 20.06 inches in June 1900.

For the period April 6–8, the 24-hour amounts of rainfall, ending at 6:10 a. m., C. S. T., at Hickory, Meridian, and Enterprise, were as follows:

Date	Meridian	Hickory	Enterprise
6	0.67	1.07	1.10
7	2.99	3.36	3.64
8	5.76	3.77	6.20
Total	9.42	8.20	10.94

The heavy rains during this period caused considerable flooding in the vicinity of Meridian and Toomsuba, about 12 miles northeast of Meridian. Sowashee Creek overflowed in the southern and western sections of Meridian, making it necessary for the Red Cross and the Meridian Police Department to rescue some 250 people from flooded homes.

The crest stage at Enterprise, Miss., 36.0 feet, was within 0.2 foot of the highest stage of record at this place. The town of Bucatunna, below Shubuta, was practically isolated by flood waters for several days. Old residents near the confluence of the Leaf and Chickasawhay stated that in places, this was the highest water in their section, although no gage records were broken at Shubuta, Merrill, or Hattiesburg.

The crest stage at Monticello, 27.6 feet on the 8th, was the highest of record, the previous highest being 26.3 feet on March 16, 1935. The crest at Columbia, 26.5 feet on the 9th, is equivalent to 27.4 feet on the old gage, and was probably near the highest water of record.

The crest stages at selected stations in the Alabama, Tombigbee, Pearl, and Pascagoula River basins, in comparison with the previous highest stages, are shown in the table below:

River	Station	Flood stage	April 1938 stage	Previous highest			
				From gage readings		Prior to gage records [1]	
Coosa	Wetumpka, Ala.	45	57.9	55.6	1919	61.7	1886
Cahaba	Centerville, Ala.	23	36.6	35.3	1936	37.8	1916
Alabama	Montgomery, Ala.	35	54.2	57.1	1919	59.7	1886
Do	Selma, Ala.	45	55.3	56.0	1929	57.0	1886
Do	Millers Ferry, Ala.	40	56.6	51.8	1933	56.8	1929
Black Warrior	Tuscaloosa, Ala.	46	63.0	68.6	1900		
Tombigbee	Lock No. 4	39	62.6	73.1	1900		
Do	Lock No. 3	33	61.2	62.9	1916	66.1	1900
Do	Lock No. 2	46	64.1	64.8	1916	65.9	1874
Do	Lock No. 1	31	46.0	50.6	1900	51.8	1874
Chickasawhay	Enterprise, Miss.	20	36.0	36.2	1919	37.2	1900
Do	Shubuta, Miss.	26	41.2	44.3	1919	45.0	1900
Pascagoula	Merrill, Miss.	22	29.7	31.0	1916	28.5	1900
Pearl	Edinburg, Miss.	20	24.6	26.2	1935	29.0	1902
Do	Jackson, Miss.	18	32.1	37.2	1902		
Do	Monticello, Miss.	15	27.6	26.3	1935	31.0	1902
Do	Pearl River, La.	12	17.0	19.7	1900	20.2	1874

[1] Obtained from high-water marks.

The loss and damage caused by the floods in the Southeastern States during April, by drainage basins, is as follows: Altamaha, $28,000; Apalachicola, $16,000; Alabama, $900,000; Black Warrior-Tombigbee (March and April), $92,000; and Pearl and Pascagoula (March and April) more than $500,000.

Upper Mississippi Basin.—The Illinois River was bankful, or over, during a long period, beginning March 24, and ending May 4. The highest stages were reached in April. Although the crest was 5.2 feet above flood stage at Havana and 7.8 feet above at Beardstown, Ill., there was no damage of consequence.

The upper Mississippi slightly exceeded flood stage at Hannibal, Mo., and Quincy and Grafton, Ill., from April 8–13, but resulted in no appreciable damage.

Ohio River Basin.—A prolonged period of high water occurred in the Wabash River system, the flooding, in portions, continuing from March 6 to April 23.

Concerning this flood the official in charge, Indianapolis, Ind., reports as follows:

Frequent and heavy rains during much of the month of March and first part of April, caused a succession of rises in the upper valleys, and a rather prolonged period of flooding in the lower valleys, particularly in the Wabash and West Fork of White, as well as in the main stream of the White. The East Fork of White was not so much affected, although moderate flooding occurred at Seymour, Ind., below the junction of the several converging streams of the upper basin that form the White at Columbus, Ind.

Stages were not high enough to cause much damage to tangible property, comparatively speaking; nor was there any great loss in movable property. The chief loss and damage was to prospective crops, chiefly winter wheat and clovers, and in the lower stretches particularly, a considerable part of the overflowed area was submerged long enough to kill entirely the prospective crop. The total loss is estimated at more than $900,000.

Light floods occurred elsewhere in the Ohio Basin, principally in the Muskingum, Scioto, Miami, Tennessee, and the lower Ohio from Mount Vernon, Ind., to Cairo, Ill. In no case was the overflow serious, the only appreciable damage reported was $23,500 in the Muskingum Valley and $3,200 in the Scioto.

Arkansas, White and Red Basins.—The floods in these basins were largely a continuation of overflows beginning the latter part of March, followed by two separate rises caused by rain periods on April 5–8 and again on the 15–17th.

The overflows were not serious; the only appreciable damage occurring in the lower Arkansas River estimated at about $100,000. Considerable caving of the river bank has occurred during the spring months at Colfax, La., on the Red River, encroaching on the town, but any losses sustained cannot be closely approximated.

Lower Mississippi Basin.—An increased flow in the upper Mississippi, together with flood stages in the lower Ohio, brought the stage at New Madrid, Mo., to about a foot above flood stage on the 5th and again on the 17th. The high stages in the Mississippi below Cairo, augmented by frequent rains resulted in stages slightly exceeding flood stage in the extreme lower Mississippi and in the Atchafalaya. Little damage resulted from the high water.

West Gulf of Mexico drainage.—Floods occurred during the month principally in the Trinity, Guadalupe, and Colorado Rivers. The flood in the Trinity began in March, being prolonged due to additional rains in April. Local thundershowers on April 23–25 caused sharp rises in the Colorado and Guadalupe Rivers. However, no great overflow resulted, except in the Trinity River where the loss in the lower portion was estimated to be more than $250,000.

Colorado Basin.—Melting snow, caused by relatively high temperature and light rains, produced a slight overflow in the Gunnison River and its tributaries in Colorado beginning about April 23. The damage from the high water was not great, the loss from reports available amounting to about $12,000.

Pacific slope drainage.—The only river gaging stations to report flood stages during the month were Kamiah, Idaho, on the Clearwater River, and Jefferson, Oreg., on the Santiam River. The official in charge, Portland, Oreg., reports as follows on the flood in the Columbia Basin:

Several days of moderate temperatures, accompanied by heavy rain near the headwaters of a few of the tributaries of the upper Columbia, brought out sufficient amounts of snow in the Okanogan, Couer d'Alene and Clearwater Rivers to cause some unusually high water in those streams. There was a considerable melting of snow at low elevations in the drainage basins of all of the tributaries south of the International Boundary, also in the Kootenai.

At the close of the month the high stages in many of the tributaries above the Willamette River had exceeded the crests for the spring and summer of 1937, and by May 3, the Columbia was discharging considerably more water at Celilo, Oreg., than at any time last year. Flood stages occurred at but two widely separated reporting stations during April—Kamiah, Idaho, on the Clearwater and Jefferson, Oreg., on the Santiam. No damage occurred near either of these stations.

Table of flood stages during April 1938

[All dates in April unless otherwise specified]

River and station	Flood stage	Above flood stages—dates		Crest	
		From—	To—	Stage	Date
ST. LAWRENCE DRAINAGE					
Lake Erie					
	Feet			*Feet*	
St. Marys: Decatur, Ind	13	Mar. 31	4	18.0	1
		8	13	19.1	10
St. Joseph:					
Fort Wayne, Ind	12	1	1	12.2	1
		9	12	14.5	10
Montpelier, Ohio	10	2	2	10.2	2
		9	12	11.1	11
Maumee:					
Fort Wayne, Ind	15	Mar. 1	2	16.5	1
		9	13	18.6	10
Napoleon, Ohio	10	9	12	11.8	11
Sandusky: Upper Sandusky, Ohio	13	9	9	13.1	9
ATLANTIC SLOPE DRAINAGE					
Roanoke: Williamston, N. C	10	14	14	10.0	14
Tar: Greenville, N. C	13	13	15	13.1	14
Neuse: Goldsboro, N. C	14	12	14	14.5	13
Cape Fear: Lock No. 2, Elizabethtown, N. C	20	10	12	23.8	11
Peedee: Mars Bluff Bridge, S. C	17	11	14	17.6	13
Black: Kingstree, S. C	12	14	14	12.1	14
Saluda: Chappells, S. C	15	3	3	16.3	3
Santee:					
Rimini, S. C	12	6	17	13.9	12, 13
		21	24	12.6	22
Ferguson, S. C	12	7	19	13.4	14, 15
		23	25	12.2	24
Savannah:					
Butler Creek, Ga	21	2	4	23.3	3
		8	10	22.7	9
Clyo, Ga	13	9	22	17.8	16
Ogeechee:					
Midville, Ga	6	9	14	7.0	12
Dover, Ga	7	11	20	9.0	16
Ocmulgee:					
Macon, Ga	18	2	4	19.8	3
		7	10	20.6	7
Hawkinsville, Ga	25	10	13	26.0	11, 12
Abbeville, Ga	11	8	19	15.8	13, 14
Lumber City, Ga	15	15	20	16.8	17
Oconee: Milledgeville, Ga	22	2	4	26.2	3
		7	10	25.9	7
Altamaha:					
Charlotte, Ga	12	10	24	20.8	17
Everett City, Ga	10	17	28	12.6	21, 22
EAST GULF OF MEXICO DRAINAGE					
Chattahoochee:					
West Point, Ga	19	8	9	20.2	9
Eufaula, Ala	40	7	12	48.0	10
Columbia, Ala	42	9	12	44.5	11
Flint:					
Montezuma, Ga	20	10	12	21.0	11
Albany, Ga	20	9	17	26.4	14
Bainbridge, Ga	25	14	18	26.3	16
Apalachicola:					
River Junction, Fla	20	10	15	22.8	13
Blountstown, Fla	15	4	28	22.2	14
Conecuh:					
River Falls, Ala	35	10	10	37.9	10
Brewton, Ala	17	13	14	17.5	13
Oostanaula:					
Resaca, Ga	22	8	12	31.5	9
Rome, Ga	25	8	14	33.8	10
Etowah:					
Canton, Ga	17	8	9	22.4	8
Cartersville, Ga	18	1	3	21.3	2
		7	10	29.2	8
Coosa:					
Mayos Bar Lock, Ga	28	8	14	36.9	10
Gadsden, Ala	20	8	18	26.9	14
Lock No. 4, Lincoln, Ala	17	7	18	24.5	9
Childersburg, Ala	20	7	12	29.9	9
Wetumpka, Ala	45	7	13	57.9	8
Tallapoosa: Milstead, Ala	40	9	9	[1] 40.0	9
Cahaba: Centerville, Ala	23	1	3	27.8	2
		7	11	36.6	8
Alabama:					
Montgomery, Ala	35	8	18	54.2	11
Selma, Ala	45	7	18	55.3	12
Millers Ferry, Ala	40	1	24	56.6	14
Black Warrior: Lock No. 10, Tuscaloosa, Ala	46	1	4	54.9	2
		7	12	63.0	8
Tombigbee:					
Gainesville, Ala	36	Mar. 24	[2] 21	47.1	10
Lock No. 4, Demopolis, Ala	39	Mar. 20	29	62.6	14
Lock No. 3, Ala	33	Mar. 15	May 1	61.2	9
Lock No. 2, Ala	46	Mar. 21	30	64.1	9
Lock No. 1, Ala	31	Mar. 20	May 3	46.0	10
Leaf: Hattiesburg, Miss	18	8	12	23.5	9

See footnotes at end of table.

Table of flood stages during April 1938—Continued

[All dates in April unless otherwise specified]

River and station	Flood stage	Above flood stages—dates		Crest	
		From—	To—	Stage	Date
EAST GULF OF MEXICO DRAINAGE—CON.					
Chickasawhay:	*Feet*			*Feet*	
Enterprise, Miss	20	1	5	28.0	4
		6	11	36.0	8
		19	21	23.8	20
Shubuta, Miss	26	4	15	41.2	10
		22	24	27.1	23
Pascagoula: Merrill, Miss	22	8	18	29.7	13
Bogue Chitto: Franklinton, La	11	8	11	16.9	9
Pearl:					
Edinburg, Miss	20	7	14	24.6	10
Jackson, Miss	18	Mar. 20	30	32.1	9, 14
Monticello, Miss	15	1	28	27.6	8
				23.6	21
Columbia, Miss	17	3	29	26.5	9
				23.2	23
Pearl River, La	12	Mar. 27	[3]	17.0	13
MISSISSIPPI SYSTEM					
Upper Mississippi Basin					
Illinois:					
Morris, Ill	13	9	13	14.5	11
Peru, Ill	17	7	19	19.5	12
Peoria, Ill	18	9	23	20.4	15
Havana, Ill	14	Mar. 24	30	19.2	15, 16
Beardstown, Ill	14	Mar. 24	May 4	21.8	15, 16
Bourbeuse:					
Union, Mo	12	1	2	12.5	1
Mississippi:					
Quincy, Ill	14	8	8	14.0	8
Hannibal, Mo	13	7	11	14.0	9
Grafton, Ill	18	10	13	18.6	11
Ohio Basin					
Walhonding: Walhonding, Ohio	8	8	11	12.7	9
Tuscarawas: Coshocton, Ohio	11	8	13	13.7	10
Muskingum: Lock No. 7, McConnelsville, Ohio	22	9	10	22.6	9
Olentangy: Delaware, Ohio	9	9	9	9.0	9
Scioto:					
La Rue, Ohio	11	7	10	13.6	8
Prospect, Ohio	10	8	11	12.4	10
Circleville, Ohio	14	7	11	17.6	9
Chillicothe, Ohio	16	8	11	19.6	10
Stillwater: Pleasant Hill, Ohio	13	7	7	13.8	7
Mad: Springfield, Ohio	11	7	8	13.0	8
Miami: Middletown, Ohio	15	8	8	15.0	8
West Fork of White:					
Anderson, Ind	10	Mar. 30	10	13.8	Mar. 31
Noblesville, Ind	14	Mar. 31	2	17.3	1
		8	10	15.6	9
Indianapolis, Ind	12	Mar. 31	2	15.0	1
		8	11	13.6	10
Elliston, Ind	18	Mar. 25	15	27.4	4
Edwardsport, Ind	12	Mar. 6	19	19.4	5
				19.2	13
East Fork of White: Seymour, Ind	14	1	3	14.8	2
		8	12	16.4	9, 10
White:					
Petersburg, Ind	16	Mar. 14	18	23.1	7
				22.6	14, 15
Hazleton, Ind	16	Mar. 10	20	24.3	8
				23.7	15
Wabash:					
Bluffton, Ind	10	Mar. 31	3	11.7	1
		8	12	12.5	10
Wabash, Ind	12	Mar. 31	4	19.6	1
		8	13	20.5	9
La Fayette, Ind	11	Mar. 31	5	20.0	2
		7	15	21.8	10
Covington, Ind	16	Mar. 31	16	23.4	4
				25.7	11
Terre Haute, Ind	14	Mar. 30	19	19.9	1
				21.7	13
Vincennes, Ind	14	Mar. 19	22	19.6	5
				21.6	16
Mount Carmel, Ill	19	Mar. 19	21	23.8	9, 16, 17
New Harmony, Ind	15	Mar. 20	23	19.3	9,10,17,18
Hiwassee: Charleston, Tenn	22	9	9	23.8	9
Tennessee:					
Bridgeport, Ala	18	10	10	18.0	10
Widows Bar Lock, Tenn., upper gage	17	9	11	19.0	10
Florence, Ala	18	8	14	20.7	12
Ohio:					
Mount Vernon, Ind	35	16	19	35.5	18
Dam No. 49, Uniontown, Ky	37	2	4	37.2	3
		16	20	38.4	18
Shawneetown, Ill	33	12	23	38.4	18
Dam No. 50, Fords Ferry, Ky	34	11	23	40.1	18, 19

Table of flood stages during April 1938—Continued

[All dates in April unless otherwise specified]

River and station	Flood stage	Above flood stages—dates		Crest	
		From—	To—	Stage	Date
MISSISSIPPI SYSTEM—continued					
Ohio Basin—Continued					
Ohio—Continued.	*Feet*			*Feet*	
Dam No. 52, Brookport, Ill.	37	Mar. 31	5	38.3	1
		12	22	39.2	16
Dam No. 53, Grand Chain, Ill.	42	Mar. 30	7	44.9	3
		10	23	45.7	16
Cairo, Ill.	40	Mar. 30	24	44.7	3, 4
				45.1	16
White Basin					
Black: Black Rock, Ark.	14	Mar. 29	26	25.1	Mar. 31
				22.9	17
White:					
Batesville, Ark.	23	Mar. 29	2	21.1	Mar. 30
		17	17	23.0	17
Newport, Ark.	26	Mar. 31	6	29.5	2
		18	18	26.2	18
Georgetown, Ark.	21	Mar. 31	(2)	25.8	6
				24.8	20–22
Clarendon, Ark.	26	3	(2)	30.6	11
				29.2	20–25
Arkansas Basin					
North Canadian: Yukon, Okla.	8	28	(2)	10.2	29
Poteau: Poteau, Okla.	21	8	11	24.6	10
		17	18	23.2	18
Petit Jean: Danville, Ark.	20	10	10	20.6	10
		16	19	23.0	17
Arkansas:					
Dardanelle, Ark.	22	Mar. 31	2	22.8	1
Morrilton, Ark.	20	Mar. 31	3	21.2	1
Red Basin					
Little Missouri: Boughton, Ark.	20	2	2	20.0	2
		18	18	20.3	18
Ouachita:					
Arkadelphia, Ark.	17	8	9	17.5	8
		16	18	20.2	17
Camden, Ark.	26	Mar. 31	25	40.1	5
				31.4	21
Monroe, La.	40	16	(2)	41.4	23–29
Black: Jonesville, La.	50	7	(2)	52.3	20–27
Little: Whitecliffs, Ark.	25	Mar. 31	6	27.0	2
		11	11	25.0	11
		18	20	26.0	19
Sulphur:					
Ringo Crossing, Tex.	20	Mar. 27	2	26.1	Mar. 29
		7	12	25.8	8
		15	21	27.7	16
Naples, Tex.	22	Mar. 30	27	28.3	2
				28.5	20
Red:					
Index, Ark.	25	Mar. 31	4	27.6	2
Fulton, Ark.	25	Mar. 31	12	31.4	4
Grand Ecore, La.	33	7	17	34.6	12, 13
Alexandria, La.	32	4	May 1	38.2	15
Lower Mississippi Basin					
Big Lake Outlet: Manila, Ark.	10	Jan. 26	25	16.1	7, 8
St. Francis:					
Fisk, Mo.	20	Mar. 30	6	24.1	2
		10	12	21.1	11
		18	20	21.9	19

Table of flood stages during April 1938—Continued

[All dates in April unless otherwise specified]

River and station	Flood stage	Above flood stages—Dates		Crest	
		From—	To—	Stage	Date
MISSISSIPPI SYSTEM—continued					
Lower Mississippi Basin—Continued					
St. Francis—Continued.	*Feet*			*Feet*	
St. Francis, Ark.	18	Mar. 31	[4] 25	23.4	4
				18.5	23, 24
Tallahatchie: Swan Lake, Miss.	26	Jan. 28	(2)	31.0	12
Yazoo: Yazoo City, Miss.	29	8	8	29.1	8
		10	(2)		
Mississippi:					
New Madrid, Mo.	34	2	7	35.0	5
		13	20	35.2	17
Greenville, Miss.	36	20	28	36.4	24–26
Angola, La.	45	17	(2)	46.6	29–May 1
Baton Rouge, La.	35	16	(2)	37.0	30
Plaquemine, La.	31	17	(2)	32.9	29–May 1
Donaldsonville, La.	28	20	(2)	28.9	30
Reserve, La.	22	27	(2)	22.1	30
Atchafalaya Basin					
Atchafalaya:					
Simmesport, La.	41	25	May 3	41.2	27–May 1
Melville, La.	37	17	(2)	38.5	27–May 1
Atchafalaya, La.	25	27	(2)	25.0	27–May 2
WEST GULF OF MEXICO DRAINAGE					
Sabine:					
Logansport, La.	25	20	(2)	26.9	23
Bon Wier, Tex.	21	8	14	22.2	9
Neches: Rockland, Tex.	22	10	14	22.8	12
Elm Fork: Carrollton, Tex.	6	Mar. 28	2	12.4	Mar. 29
Trinity:					
Dallas, Tex.	28	Mar. 28	4	38.8	Mar. 30
Trinidad, Tex.	28	Mar. 29	25	41.8	5
Long Lake, Tex.	40	2	26	44.4	20
Liberty, Tex.	24	9	(2)	26.5	30
Colorado:					
Columbus, Tex.	24	26	26	26.0	26
Wharton, Tex.	26	28	28	27.1	28
Guadalupe:					
Gonzales, Tex.	20	25	[4] 29	30.5	26
Victoria, Tex.	21	25	3		
GULF OF CALIFORNIA DRAINAGE					
Colorado Basin					
North Fork of Gunnison: Paonia, Colo.	9	26	26	9.0	26
		30	30	9.0	30
Gunnison: Delta, Colo.	9	23	(2)	10.6	26
PACIFIC SLOPE DRAINAGE					
Columbia Basin					
Clearwater: Kamiah, Idaho	12	18	20	14.5	19
Santiam: Jefferson, Oreg.	10	18	18	10.2	18

[1] Approximate.
[2] Fell slightly below flood stage on the 1st.
[3] Continued at end of month.
[4] Fell slightly below flood stage on 20th and 21st.
[5] Fell below flood stage on 28th.

WEATHER ON THE ATLANTIC AND PACIFIC OCEANS

[The Marine Division, I. R. TANNEHILL in charge]

NORTH ATLANTIC OCEAN, APRIL 1938

By H. C. HUNTER

Atmospheric pressure.—Most of the North Atlantic regions had pressure higher than normal. The excess was remarkably large near the British Isles, being one-half inch at Valencia, Ireland, where even the lowest reading of the month was 0.14 inch above the month's normal. Throughout almost all American waters there was a moderate excess of pressure.

A small portion of the northwestern North Atlantic had average pressure somewhat less than normal; at Julianehaab, Greenland, there were considerable fluctuations, but for only a short period just before the middle of the month did the pressure remain considerably above normal for as long as three successive days. The southeastern North Atlantic likewise averaged below normal for pressure. Horta, in the Azores, usually near the center of the North Atlantic HIGH, averaged one-fifth of an inch below normal, the chief periods when pressure there rose to near normal being the first 5 days and the final week of the month.

In available vessel reports the extremes of pressure noted are 30.74 and 28.75 inches. The higher reading was reported by the American steamship *Cranford* near the western end of the English Channel just before noon of

the 11th. The Dutch liner *Maasdam* furnished the low reading, which was noted about 6 p. m. of the 8th, near 44° north latitude, 41° west longitude.

TABLE 1.—*Averages, departures, and extremes of atmospheric pressure (sea level) at selected stations for the North Atlantic Ocean and its shores, April 1938*

Stations	Average pressure	Departure	Highest	Date	Lowest	Date
	Inches	*Inch*	*Inches*		*Inches*	
Julianehaab, Greenland	29.72	−0.11	30.28	14	28.92	4
Reykjavik, Iceland	29.94	+.14	30.45	17	29.41	5
Lerwick, Shetland Islands	30.17	+.37	30.71	11	29.21	2
Valencia, Ireland	30.39	+.50	30.71	12	30.03	2
Lisbon, Portugal	29.98	−.01	30.24	1	29.59	27
Madeira	29.89	−.12	30.09	1, 10	29.50	12
Horta, Azores	29.95	−.20	30.18	27	29.62	9
Belle Isle, Newfoundland	29.99	+.10	30.72	25	28.86	10
Halifax, Nova Scotia	30.04	+.11	30.50	17, 25	29.04	10
Nantucket	30.03	+.06	30.47	17	29.10	9
Hatteras	30.07	+.06	30.45	27	29.43	9
Bermuda	30.15	+.06	30.42	11	29.82	10
Turks Island	30.04	+.02	30.09	1, 11, 12	29.93	24
Key West	30.03	+.01	30.18	11	29.87	9
New Orleans	30.05	+.05	30.33	3	29.56	7

NOTE.—All data based on a. m. observations only, with departures compiled from best available normals related to time of observation, except Hatteras, Key West, Nantucket, and New Orleans, which are 24-hour corrected means.

Cyclones and gales.—Before the 7th and again from the 14th on to the end of April the North Atlantic weather was comparatively uneventful. Even the period from the 7th to 13th, inclusive, was not specially stormy over the eastern third of the Atlantic.

There were three low areas particularly connected with the stormy conditions of the second week. The first of these was centered near the mouth of the St. Lawrence River on the morning of April 5, but was not then very intense. Its eastward advance brought it on the 7th to near the southeastern edge of the Grand Banks, with a marked increase in strength, and the next morning, while it had not advanced far, its intensity had further increased. On the 9th and 10th the center inclined more and more to a northward course and by the evening of the 9th it had lost strength somewhat. The position on the evening of the 10th was about 55° N., 30° W.

The American steamship *Black Tern* and the Danish steamship *Frode* estimated the greatest force of wind connected with this LOW as 12, and another vessel reported force 11. No other force–12 winds have been reported from Atlantic waters for the month. This storm caused very rough passages for some of the largest liners; it also gave the month's lowest barometer reading as mentioned in an earlier paragraph.

The next LOW of importance covered Texas and northeastern Mexico on the evening of the 6th, and caused high winds over much of the Gulf of Mexico on the 7th. By the morning of the 9th the center was over Pennsylvania, with a trough stretching southward to Florida, so that waters just east of the Middle and South Atlantic States were greatly affected. The next morning found the center over the Gulf of St. Lawrence. Northers were noted at this time over much of the western Caribbean section, while off the eastern coast of the United States and Canada many vessels reported gales, one estimating a force of 11, encountered a moderate distance north of Bermuda.

The cyclonic center and its southward-extending trough advanced toward the north-northeast during the next 24 hours, till the system reached from west of southern Greenland to the Grand Banks; thereafter it diminished in intensity.

The last LOW of the series in this stormy week was probably not intense except within a very limited area. The evening of the 12th brought reports indicating a small disturbance to southeastward of Cape Hatteras, and the next day found the center not far from Bermuda, with considerable strength, especially in the evening. The British steamship *Bayano*, westbound, had a brief experience with the storm, the wind shifting altogether 18 points, and the barometer dropping to 29.16 inches, while the force was as high as 10 for a few minutes. The ship's position at the time was nearly 200 miles east-northeast of Bermuda.

During succeeding days the LOW moved slowly eastward, with apparently less intensity at the center, but affecting to a moderate extent a larger area than when over the western Atlantic. It was near the western Azores on the 19th, while even as late as the 23d, near Madeira, it could still be identified.

Just before the end of the month a storm of considerable strength was noted, traversing the lower St. Lawrence Valley on the 27th and showing an increase of energy by the night of the 28th–29th. At this time it was centered over the eastern Grand Banks, where one vessel, to northward of the most traveled lanes, reported a whole gale (force 10). A decided change of course toward the north soon afterward carried this storm still farther away from the principal vessel routes.

Fog.—As frequently happens in April, fogginess this month showed a considerable increase over March in days of occurrence nearly everywhere from the vicinity of Hatteras to the eastern limits of the Grand Banks. On the other hand two important areas where March had brought considerable fog were almost entirely free from fog in April. One of these extends near the 50th parallel of latitude from the 35th meridian to the western coast of Europe; the other embraces the northern part of the Gulf of Mexico. But during April there still was a little fog in one square of the northwestern Gulf of Mexico, where 3 days with fog were reported.

Near the coast of the South Atlantic States very little fog was noted to southward of 35° latitude. But north of 35° to 40° between 70° and 75° west longitude, there was fog on 14 days, well distributed through the month, a total exceeding that of any other 5° square of the North Atlantic.

Near New England and Nova Scotia there was somewhat less fog than in the square mentioned, and practically all of it occurred after the 12th. In the Newfoundland-Grand Banks area the square of most fog frequency was that of 40° to 45° N., 50° to 55° W., where there was fog on 10 days, quite well distributed through the month.

On the 9th a collision just outside New York Bay resulted from fog, and during the period 25th to 27th fog led to three collisions close to the coast at different locations from near Cape Cod to the entrance to Delaware Bay. There seems to have been no loss of life and only one vessel involved had to be beached to prevent sinking; and that vessel was presently brought to port.

OCEAN GALES AND STORMS, APRIL 1938

Vessel	Voyage		Position at time of lowest barometer		Gale began April—	Time of lowest barometer April—	Gale ended April—	Lowest barometer	Direction of wind when gale began	Direction and force of wind at time of lowest barometer	Direction of wind when gale ended	Direction and highest force of wind	Shifts of wind near time of lowest barometer
	From—	To—	Latitude	Longitude									
NORTH ATLANTIC OCEAN			° ′	° ′				*Inches*					
Vincent, Am. S. S.	Havre	New York	45 40 N.	33 20 W.	[1] 31	2a, 1	1	29.39	S	SSW, 8	WSW	WSW, 10	S-WSW.
West Cohas, Am. S. S.	Manchester	New Orleans	31 00 N.	49 10 W.	[1] 31	4a, 1	1	29.72	NW	NW, 7	NW	NW, 8	None.
Chickasaw City, Am. S. S.	New York	Cristobal	35 00 N.	73 52 W.	2	6p, 2	2	29.56	SW	SW, 7	NNW	SW, 8	
West Cusseta, Am. M. S.	Gibraltar	New York	[2] 36 58 N.	48 57 W.	6	10p, 6	8	29.84	SW	W, 9	N	NW, 9	SW-WNW.
Swiftsure, Am. S. S.	Charleston	Atreco	25 54 N.	85 45 W.	7	Noon, 7	9	29.87	SE	S, 7	NW	WNW, 10	SE-SW-WNW.
Narbo, Am. S. S.	Rotterdam	Corpus Christi	26 42 N.	89 54 W.	7	6p, 7	9	29.70	NW	SSE, 6	NW	NW, 8	SSE-NW.
Delrio, Am. S. S.	Trinidad	New Orleans	21 00 N.	85 00 W.	7	6p, 7	9	29.90	SE	SE, 6	WNW	NW, 8	None.
American Importer, Am. S. S.	Belfast	Boston	41 35 N.	48 20 W.	7	Mtd, 7	9	29.33	W	W, 9	WNW	W, 9	W-NW.
American Banker, Am. S. S.	London	New York	41 28 N.	47 45 W.	7	4a, 8	9	29.27	W	WNW, 10	NNW	WNW, 11	WNW-NNW.
Exeter, Am. S. S.	Gibraltar	Boston	40 12 N.	43 06 W.	7	9a, 8	9	29.13	W	W, 8	NW	W, 10	None.
Black Tern, Am. S. S.	Rotterdam	New York	41 47 N.	45 15 W.	7	9a, 8	9	29.22	W	W, 10	NW	WNW, 12	W-WNW.
Omphale, Fr. S. S.	Corpus Christi	Donges	39 40 N.	51 20 W.	6	Noon, 8	10	[3] 29.92	WNW	NNW, 10	NNW	NNW, 10	
Luminous, Br. S. S.	Hamburg	Curacao	37 05 N.	35 45 W.	7	4p, 8	10	29.45	W	W, 9	NW	W, 9	SW-WNW.
Dinteldijk, Du. M. S.	Cristobal	Liverpool	[2] 38 30 N.	43 17 W.	7	4p, 8	9	29.37	W	WNW, 8	WNW	WNW, 9	None.
Binnendijk, Du. S. S.	Rotterdam	New Orleans	37 32 N.	38 47 W.	8	6p, 8	9	29.36	W	WSW, 9	NNW	W, 9	WSW-WNW.
Maasdam, Du. S. S.	do	New York	44 19 N.	40 52 W.	8	6p, 8	9	28.75	NW	S, 4	NW	NW, 9	SW-SE-NE.
Frode, Dan. S. S.	Swansea	Boston	[2] 46 44 N.	43 21 W.	7	8p, 8	10	29.15	S	N, 3	NW	NNE, 12	SW-N.
Warrior, Am. S. S.	Mobile	London	[2] 47 22 N.	27 07 W.	8	1a, 9	9	29.18	SE	SSE, 10	S	SSE, 10	SSE-SSW.
Nyhorn, Nor, M. S.	Cristobal	Glasgow	47 55 N.	27 58 W.	8	4a, 9	11	[3] 29.41	S	SE, 9	SE	SSE, 10	None.
Washington, Am. S. S.	New York	Cobh	40 40 N.	42 45 W.	8	4a, 9	10	29.63	NW	NW, 9	NW	NW, 10	
Amapala, Hond. S. S.	do	Key West	32 09 N.	76 24 W.	9	10a, 9	10	29.61	SW	WSW, 8	NW	WNW, 10	SW-WSW.
Queen of Bermuda, Br. S. S.	Bermuda	New York	37 24 N.	70 28 W.	9	6p, 9	9	29.28	S	SSW, 8	W	SSW, 8	SSW-W.
Van Rensselaer, Du. S. S.	Inagua	do	34 43 N.	74 08 W.	9	2a, 10	10	29.51	S	WSW, 8	NNW	WNW, 8	SSW-WNW.
Lysefjord, Nor. S. S.	Kingston	Tela	[2] 16 35 N.	82 47 W.	10	4a, 10	10	30.00	NNW	NNW, 6	NNW	NNW, 7	E-NNW.
West Cusseta, Am. M. S.	Gibraltar	New York	37 30 N.	61 28 W.	10	8a, 10	10	29.60		SSW, 9		SSW, 9	
American Importer, Am. S. S.	Belfast	Boston	41 48 N.	60 05 W.	10	Noon, 10	11	29.32	S	W, 3	WNW	S, 9	SW-W.
Greystoke Castle, Br. M. S.	Belawan	New York	34 57 N.	64 28 W.	10	Noon, 10	11	29.61	SSW	SSW, 10	N	SW, 11	SSW-W.
Tolua, Am. S. S.	Cristobal	Tela	13 07 N.	83 00 W.	10	5p, 10	11	29.90	N	N, 5	NW	NW, 7	NNE-N-NNW.
Collamer, Am. S. S.	New York	Havre	41 00 N.	52 23 W.	9	10p, 10	10	29.35	S	SW, 10	SW	SW, 10	SW-WNW.
Rhexenor, Br. S. S.	Dakar	Boston	36 42 N.	55 17 W.	10	2a, 11	11	29.69	SSW	S, 9	N	S, 9	S-WNW.
Maasdam, Du. S. S.	Rotterdam	New York	41 04 N.	53 13 W.	10	2a, 11	11	29.33	SSW	SSW, 8	NW	SSW, 10	SSW-NW.
Europa, Ger. S. S.	Cherbourg	do	41 39 N.	51 56 W.	10	4a, 11	11	29.47	SSW	S, 7	NNW	S, 9	S-SW.
Bayano, Br. S. S.	Bristol	Bermuda	32 54 N.	61 27 W.	13	8p, 13	13	29.16	SE	SW, 8	NNW	SW, 10	SE-SW-NNW.
Esso Houston, Am. S. S.	Aruba	London	40 42 N.	37 18 W.	13	4a, 14	13	29.98	NW	N, 5	N	NW, 9	
Malvina, Du. M. S.	Lisbon	Houston	[2] 28 36 N.	58 53 W.	14	4a, 15	15	29.64	W	W, 7	NNW	NW, 9	W-NW.
Sembilan, Du. S. S.	Dakar	Halifax	30 47 N.	46 35 W.	18	10p, 16	18	29.80	NNE	N, 2	NNE	NE, 8	
Mayumbe, Belg. S. S.	do	Antwerp	34 05 N.	13 48 W.	19	11a, 17	20	29.95	NE	WNW, 5	E	ENE, 8	
Jamaica Producer, Br. S. S.	Kingston	London	38 44 N.	42 42 W.	18	7a, 19	19	29.52	NNE	NW, 6	NW	NW, 8	NNW-NW.
Sembilan, Du. S. S.	Dakar	Halifax	40 10 N.	59 54 W.	19	10a, 20	20	29.89	SSW	SSW, 8	SSW	SSW, 8	
Independence Hall, Am. S. S.	Havre	New York	41 50 N.	59 00 W.	28	2p, 28	28	29.80	SW	W, 8	WNW	W, 8	SW-W.
Mormacsea, Am. S. S.	Copenhagen	Newport News	48 38 N.	37 42 W.	29	9a, 29	30	29.17	SSW	WSW, 9	NW	W, 10	SSW-W.
NORTH PACIFIC OCEAN													
Silvermaple, Br. M. S.	Cebu, P. I.	Portland, Oreg.	14 52 N.	128 31 E.	1	Noon, 2	3	29.86	NE	NE, 7	E	NE, 7	NE-E.
Skramstad, Nor. M. S.	Los Angeles	Yokohama	34 21 N.	140 42 E.	4	8a, 4	4	29.53	SW	SW, 8	SW	SW, 8	SW-NE.
Athelcrown, Br. M. S.	Yokohama	Estero	38 56 N.	159 03 E.	5	10a, 5	5	29.54	S	SSE, 8	SW	S, 8	SSE-SW.
Pres. Jefferson, Am. S. S.	do	Victoria, B. C.	46 27 N.	166 25 E.	4	8p, 5	6	29.43	S	S, 9	S	S, 9	None.
Columbian, Am. S. S.	Los Angeles	Balboa	12 12 N.	93 00 W.	8	6p, 9	9	29.80	NE	ENE, 2	N	N, 7	
San Clemente Maru, Jap. M. S.	Kobe	San Francisco	38 46 N.	147 56 E.	11	Noon, 12	12	29.23	SE	SSE, 4	ESE	ESE, 8	ESE-S.
Pres. Taft, Am. S. S.	Honolulu	Yokohama	34 30 N.	157 24 E.	13	8a, 13	13	29.03	S	SSW, 7	W	SW, 12	S-W.
Peter Maersk, Dan. M. S.	Yokohama	Los Angeles	44 13 N.	167 13 E.	13	11p, 13		29.22		E, 8		E, 8	
Hoegh Hood, Nor. M. S.	do	do	43 00 N.	174 00 W.	13	6a, 14	14	28.90	ESE	SE, 6	SE	ESE, 8	ESE-S.
Chichibu Maru Jap. M. S.	do	Honolulu	35 06 N.	157 00 E.	14	10a, 14	15	29.70	WNW	WSW, 6	WNW	WNW, 8	SSE-W.
Silvermaple, Br. M. S.	Cebu, P. I.	Portland, Oreg.	42 38 N.	157 35 W.	13	2p, 15	15	28.89	S	WNW, 8	WNW	WNW, 8	SW-WNW.
Empress of Canada, Br. S. S.	Honolulu	Yokohama	34 59 N.	146 17 E.	15	4p, 15	16	29.40	S	SW, 10	WSW	W, 11	SW-W.
Komaki Maru, Jap. M. S.	Yokohama	San Francisco	45 14 N.	158 23 W.	16	Noon, 15	16	29.04	W	NNE, 4	WSW	W, 8	NNE-NNW.
Pres. McKinley, Am. S. S.	do	Victoria, B. C.	36 30 N.	143 00 E.	16	10a, 16	17	29.56	W	W, 7	NW	W, 10	WSW-W.
Fujisan Maru, Jap. M. S.	Kure	Los Angeles	[2] 42 51 N.	175 33 E.	17	6p, 17	17	[3] 29.50	S	SW, 5	SW	S, 8	S-WSW.
Empress of Russia, Br. S. S.	Victoria	Yokohama	[2] 50 21 N.	133 04 W.	17	6p, 17	18	29.60	SSW	SW, 9	W	SW, 9	SSW-W.
Nozima Maru. Jap. M. S.	Yokohama	Los Angeles	43 30 N.	164 26 E.	18	6a, 17	18	29.31	SW, 6	SW, 6	W	W, 8	SSW-WSW.
Pres. McKinley, Am. S. S.	do	Victoria, B. C.	50 00 N.	141 51 W.	22	6a, 25	25	29.62	SSE	S, 7	S	SSE, 9	
Taiyo Maru, Jap. S. S.	do	San Francisco	35 00 N.	144 12 E.	28	10a, 28	28	29.70		W, 8		W, 8	SE-WNW.

[1] March.
[2] Position approximate.
[3] Barometer uncorrected.

NORTH PACIFIC OCEAN, APRIL 1938

By WILLIS E. HURD

Atmospheric pressure.—As in March, the average pressure over the Aleutian Islands and vicinity for April 1938 was extraordinarily low. At Dutch Harbor the mean pressure, 29.48, was the lowest of record for the month in the past 23 years. At St. Paul the average 29.49 was the lowest in the April record of 13 years. At both stations the averages had a departure of −0.30 inch from the normal. The lowest known pressure reading of the month in the North Pacific area was 28.20, recorded at Dutch Harbor on the 27th.

Coincident with this strong development of the Aleutian LOW was an almost equally great development of the North Pacific HIGH in south central midocean, as shown by the Midway Island average pressure, 30.23 inches, which is 0.11 inch above the normal.

Elsewhere, near normal pressures prevailed.

TABLE 1.—*Averages, departures, and extremes of atmospheric pressure at sea level, North Pacific Ocean, April 1938, at selected stations*

Station	Average pressure	Departure from normal	Highest	Date	Lowest	Date
	Inches	*Inch*	*Inches*		*Inches*	
Point Barrow	30.06	−0.03	30.60	5	29.72	29
Dutch Harbor	29.48	−.30	30.20	9	28.20	27
St. Paul	29.49	−.30	30.10	5	28.40	27
Kodiak	29.63	−.12	30.08	23	28.84	28
Juneau	29.88	−.08	30.31	19	29.32	17
Tatoosh Island	30.06	+.06	30.39	18	29.74	16
San Francisco	30.06	+.01	30.27	1	29.73	4
Mazatlan	29.90	+.01	29.98	11	29.84	6, 27
Honolulu	30.04	−.02	30.17	12	29.94	16
Midway Island	30.23	+.11	30.45	5	30.06	22
Guam	29.85	−.04	29.92	13	29.77	6, 7
Manila	29.79	−.03	29.89	1	29.62	9
Hong Kong	29.86	−.02	30.12	1	29.65	22
Naha	29.94	+.02	30.24	1	29.77	20, 21, 22

NOTE.—Data based on 1 daily observation only, except those for Juneau, Tatoosh Island, San Francisco, and Honolulu, which are based on 2 observations. Departures are computed on best available normals related to time of observation.

Cyclones and gales of the extratropics.—Despite the strong barometric developments over middle longitudes of the ocean, only moderately stormy weather conditions were reported for the month by ships traversing the central part of the steamer routes. For the entire area lying between longitudes 170° E. and 160° W., the heaviest gales thus far indicated in weather reports did not exceed force 8, and those on only 4 or 5 days between the 8th and 18th of the month.

To the westward of the 170th meridian of east longitude, as far as the Japanese coast and to the northward of the 30th parallel, somewhat stormier conditions prevailed but for the most part were confined to the early half of April.

From the 3d to 5th a cyclone center advanced from extreme northern Japanese waters across the Kuril Islands to Kamchatka. By the 4th it had so expanded as to affect a large region, with the result that south to southwest gales of force 8 were experienced as far south as the waters southeast of Honshu and as far east along the northern steamship route as longitude 165° E., at latitude 45° N. On the 5th the storm region had gone northward, but the wind had increased somewhat in strength, as shown by a report from the American steamer *President Jefferson* of a south gale of force 9 near 46½° N., 166½° E.

During the 12th to 18th several cyclones disturbed the waters both west and east of Japan and then moved northward toward Kamchatka or northeastward toward the Aleutians. The earlier of these caused fresh gales between Honshu and longitude 150° E. on the 12th, and gales of higher force somewhat farther to the eastward in middle latitudes on the 13th. The most important of these, a southwest wind of local hurricane intensity, lowest barometer 29.03, was encountered in the morning by the American steamer *President Taft* near 34½° N., 157½° E. Decreasing gales continued thereafter until late in the afternoon of the 13th, during this vessel's voyage toward Yokohama.

A further gale of importance in this vicinity (34°59′ N., 146°17′ E.) was of force 11 from west, encountered by the British steamship *Empress of Canada* on the 15th. About a day's journey out from Yokohama on the 16th the steamer *President McKinley* met a west gale of force 10. On the 18th a fresh gale was experienced by another ship southeast of the Kuril Islands. Thereafter, the waters in the neighborhood of Japan were practically free from storminess until the end of April.

Between 160° west longitude and the American coast the weather of the month was for the most part moderate. Gales of force 8–9 occurred on only about 5 days north of the 30th parallel, scattered between the 5th and 24th.

Typhoon.—Subjoined is an account by the Rev. Bernard F. Doucette, S. J., Weather Bureau, Manila, P. I., of a typhoon which occurred in the Far East during April 6–13. In addition to the data presented by Fr. Doucette, the following observations received at the Weather Bureau by radio from the U. S. S. *Cavite* may be mentioned. On April 10 this vessel, in about 16° N., 131° E., had a north-northeast wind, force 8, barometer 29.40. On the 11th, as shown on our p. m. map, this vessel, while near 22½° N., 131° E., had a south wind of force 12, barometer 29.21.

Minor gales of the Tropics.—Aside from the typhoon in the Far East already mentioned, there was a minor disturbance east of the Philippines on the 1st and 2d. In this LOW the strongest wind thus far indicated was of force 7, met on the 2d by the British motorship *Silvermaple*, in 14°52′ N., 128°31′ E. On the 7th, close to the eastward of the Hawaiian Islands, the northeast tradewind, according to one observation, was intensified to force 7. South of the Gulf of Tehuantepec a norther-type wind of like force was observed on the 9th.

Fog.—A general increase in fog was observed this month over the northern and central steamer routes. While fog did not occur in any one locality, except along the American coast, on more than 1 or 2 days, yet it was widely distributed locally. It was most frequent between latitudes 30°–40° N., longitudes 125°–135° W., where it was observed on the 15th to 18th. Off the California coast it was observed on the 17th, 18th, and 22d. It was reported on the 17th and 19th off Lower California, and on the 17th south of Costa Rica.

TYPHOONS AND DEPRESSIONS OVER THE FAR EAST, APRIL 1938

BERNARD F. DOUCETTE, S. J.

[Weather Bureau, Manila, P. I.]

Typhoon.—April 6–13, 1938.—The first indications of the formation of this storm appeared when the pressure at Yap began to fall on April 6. The afternoon weather map had definite signs of the presence of a low-pressure area, perhaps a depression about 250 miles east-southeast of Yap. This disturbance moved west-by-north and intensified into a typhoon, April 7, 6 a. m., and continued moving in the same direction for the next 2 days. Late in the afternoon of April 9, it began to incline to the west-northwest, a change which continued through the night, so much so that the typhoon had a northerly course

during the early morning hours of April 10, the center being about 300 miles east of Samar. During the day it was moving north-northeast, tending to shift to the northeast as it moved away from the Philippines. Moving rapidly at this stage, it continued along its course, passing close to and south of the Bonin Islands during the afternoon hours of April 12. There were indications of its existence on the weather map of April 13, but the few ships' observations received at the Observatory from that region indicate that the typhoon weakened and probably filled up on April 13 and 14.

This typhoon was well developed as it passed south of Yap and north of Palau. Of the series of synoptic observations reported by Yap during these days (April 7–10), the lowest pressure was 748.5 mm. (29.468 in.) on April 8, 2 p. m. East winds, force 6, with rain on April 8, 6 a. m., were the strongest reported in the same series of observations, pressure at the time being 749.3 mm. (29.500 in.). Palau, April 9, 6 a. m., had pressure of 749.2 mm. (29.496 in.) with west-southwest winds, force 9, and raining, this pressure value being the lowest in the series of observations plotted on the weather maps.

Observations from the S. S. *City of Lyons* on April 10 were invaluable for indicating the recurvature of the typhoon. Pressure over the Philippines was falling on April 9 and 10, so much so that the typhoon seemed to be approaching the Archipelago along a west-northwest course. The afternoon observation, April 10, from the S. S. *City of Lyons* showed a decided fall in pressure together with stronger winds. Observations during that night, while the ship was hove to in latitude 16° N, longitude 130°55′ E, show that the typhoon center passed close to and east of the ship. Hurricane winds were experienced from the northeast, backing to northwest during the night. The minimum pressure was 29.04 in. (737.62 mm.) at various times between midnight and 2 a. m. April 11.

The U. S. A. T. *Meigs* copied the following message broadcast from the S. S. *Garonne* on April 12, which information is of importance in determining the movement of the typhoon after passing the S. S. *City of Lyons*. The message reads as follows: "At 6 a. m. barometer 29.00 wind south 12, sea confused, barometer 8 a. m. 29.20, wind veering force 12, sea confused, overcast with heavy rain. Position 8 a. m., 21°.57′ 139°.36″ ".

It is to be noted that this typhoon recurved while pressure over the Philippines was falling. On April 9 and 10, a consideration of the situation, without the observations from the S. S. *City of Lyons*, would indicate the approach of the typhoon center along a west-northwest course. No rise of pressure occurred as an indication that the typhoon would recurve. The pressure values observed on board the S. S. *City of Lyons* (which was enroute to Manila, via San Bernardino Strait) show falling pressure April 8 to 10, but there was nothing extraordinary in this, since the ship was moving toward the regions under the influence of the storm, and not until the forenoon hours of April 10 did the captain have any certainty that the typhoon had changed its course and was moving toward his locality. The afternoon observations, however, showed a rapid fall in pressure, a positive sign of recurvature at that time. During these hours, pressure began to rise over the Philippines, confirming the indications given by the observations from the S. S. *City of Lyons*. A study of the weather situation over the regions southwest of the Bonin Islands on April 9 and 10 may give the reason for the recurvature.

An interesting event on board the S. S. *City of Lyons* was the approach of two sea birds on the afternoon of April 9. These birds appeared tame which is unusual for them. They flew down upon the deck, then arose, after eating a few sardines, (the only things they selected from the menu offered them) and in a few minutes were back on shipboard. They rode out the storm with the ship and died when clear weather came. The captain thought they were exhausted when they came to the ship, and from their actions had his first suspicions that the typhoon was recurving.

72679—38——2

CLIMATOLOGICAL TABLES

CONDENSED CLIMATOLOGICAL SUMMARY

In the following table are given for the various sections of the climatological service of the Weather Bureau the monthly average temperature and total rainfall; the stations reporting the highest and lowest temperatures, with dates of occurrence; the stations reporting the greatest and least total precipitation; and other data as indicated by the several headings.

The mean temperature for each section, the highest and lowest temperatures, the average precipitation, and the greatest and least monthly amounts are found by using all trustworthy records available.

The mean departures from normal temperatures and precipitation are based only on records from stations that have 10 or more years of observations. Of course, the number of such records is smaller than the total number of stations.

TABLE 1.—*Condensed climatological summary of temperature and precipitation by sections, April 1938*

[For description of tables and charts, see REVIEW, January, p. 29]

Section	Temperature								Precipitation					
	Section average	Departure from the normal	Monthly extremes						Section average	Departure from the normal	Greatest monthly		Least monthly	
			Station	Highest	Date	Station	Lowest	Date			Station	Amount	Station	Amount
	°F.	°F.		°F.			°F.		In.	In.		In.		In.
Alabama	64.1	+0.5	Evergreen	93	30	3 stations	28	13	9.53	+5.03	Selma No. 2	20.51	Mobile Airport	1.81
Arizona	57.8	−.6	2 stations	106	19	Bright Angel	5	1	.22	−.42	St. Johns	.92	17 stations	.00
Arkansas	62.1	+.6	do	94	120	2 stations	24	12	4.83	+.03	Crossett	8.85	Big Lake Outlet	2.22
California	54.6	−1.5	El Cantro	106	19	Soda Springs	−4	6	2.00	+.35	Scales	8.50	10 stations	.00
Colorado	44.9	+1.2	2 stations	91	122	Hermit	−16	2	2.06	+.30	Hawthorne	5.75	Fruita	.24
Florida	70.2	+.4	Ocala	96	18	Garniers (near)	31	9	1.31	−1.55	Marianna	5.80	Everglades	T
Georgia	63.6	+.3	2 stations	95	30	Blairsville	22	4	6.88	+3.03	Concord	14.12	Glennville	.70
Idaho	45.5	+.5	Bruneau	86	29	Obsidian (near)	−11	2	1.45	+.03	Pete King	5.41	Gooding	.07
Illinois	54.4	+2.0	Sparta	89	19	Marengo	19	5	3.11	−.37	Griggsville	5.56	Claro	1.27
Indiana	54.4	+2.6	Rome	90	26	3 stations	19	13	2.57	−.93	LaPorte	5.55	North Vernon	.67
Iowa	50.3	+1.6	Thurman	87	30	Forest City	15	2	3.66	+.93	Boone	6.12	Dubuque	2.01
Kansas	55.0	+.3	2 stations	92	29	Syracuse	13	9	2.41	−.12	Pleasanton	4.52	Manhattan	1.11
Kentucky	59.3	+3.1	Pippapass	91	27	Anchorage	22	3	2.85	−1.11	Middlesboro	6.64	Owensboro, Dam 46	.86
Louisiana	66.2	−.9	7 stations	91	129	Belle Chasse	28	10	7.06	+2.39	Cheneyville	19.10	New Orleans (Shushan).	1.55
Maryland-Delaware	54.8	+3.0	Cumberland, Md	94	27	Mount Savage, Summit, Md.	19	10	1.77	−1.68	Sines, Md	3.45	Hancock (City), Md	1.13
Michigan	44.5	+1.8	Onaway	87	27	Deer Park	1	7	1.62	−.85	Calumet	4.86	Ludington	.24
Minnesota	43.7	+.7	3 stations	86	127	Mizpah	−8	5	3.11	+1.00	Waseca	5.41	Angus	1.05
Mississippi	64.3	−.3	Columbia	93	30	University	29	10	8.42	+3.52	Shubuta	18.70	Biloxi	1.76
Missouri	56.7	+1.5	3 stations	89	119	Goodland	18	3	3.68	−.23	Clinton	7.82	Parma	1.25
Montana	43.3	+.4	2 stations	90	30	Chessman Reservoir	−15	1	.71	−.41	Trout Creek (near)	2.85	Flatwillow (near)	.06
Nebraska	50.3	+1.1	3 stations	90	125	2 stations	0	8	3.02	+.64	Schuyler	7.32	Table Rock	1.42
Nevada	49.3	+1.4	Las Vegas	100	19	Montello	1	1	1.26	+.49	Owyhee	3.60	Boulder City	.01
New England	46.3	+2.6	Springfield, Mass	93	28	First Connecticut Lake, N. H.	−7	11	2.88	−.45	Nantucket, Mass	5.72	Bethlehem, N. H	1.20
New Jersey	53.0	+3.3	2 stations	94	120	Charlotteburg	12	11	2.82	−.79	Paterson	3.95	Belleplain	1.65
New Mexico	51.1	−.4	Lovington	98	26	Selsor's Ranch	−9	2	.50	−.36	Lake Alice	3.22	6 stations	.00
New York	46.6	+2.4	Port Jervis	93	28	McKeever	−4	6	2.58	−.40	Addison	5.07	Chazy	1.27
North Carolina	59.6	+1.7	Goldsboro	91	29	Mount Mitchell	7	3	4.32	+.70	Clinton	10.73	Asheville	1.47
North Dakota	42.8	+1.4	2 stations	90	30	2 stations	1	2	1.09	−.33	Wahpeton	4.28	Howard	T
Ohio	52.8	+3.0	3 stations	90	27	3 stations	19	5	3.18	+.05	Delaware	5.51	Hamilton No. 2	1.54
Oklahoma	59.4	−.9	Hollis	94	30	2 stations	15	17	2.88	−.44	Alva	5.34	Altus	.76
Oregon	47.3	+.2	Nyssa	87	29	do	0	1	1.87	−.14	Valsetz	8.32	Seneca	.05
Pennsylvania	51.3	+2.7	4 stations	92	127	Ridgway	11	10	2.85	−.57	Clarion	5.22	Huntsdale	1.08
South Carolina	62.8	+.5	Blackville	93	29	Caesars Head	25	3	6.30	+3.14	Dillon	10.26	Cherokee (near)	2.08
South Dakota	47.4	+1.6	3 stations	91	30	Bell Fourche	−4	7	2.47	+.41	Academy	6.96	Ludlow	.15
Tennessee	60.4	+1.7	Loudon	91	26	3 stations	22	13	4.63	+.20	Parksville	9.56	2 stations	1.63
Texas	64.5	−1.6	3 stations	100	6	2 stations	12	17	3.40	+.37	Yoakum	12.95	Langtry	.00
Utah	48.1	+1.0	St. George	90	119	Silver Lake	−4	2	1.08	−.09	Kimberly	5.33	3 stations	T
Virginia	56.9	+2.4	Lincoln	92	28	Mountain Lake	18	3	2.59	−.75	Diamond Springs	7.15	do	.99
Washington	49.4	+1.2	3 stations	88	18	Bumping Lake	8	1	2.38	−.04	Canto	12.39	2 stations	.00
West Virginia	54.8	+3.0	2 stations	92	127	2 stations	18	110	3.06	−.45	Charleston	4.90	Wardensville	1.08
Wisconsin	45.4	+1.8	Mondovi	86	27	3 stations	4	5	3.07	+.53	Superior	6.66	West Bend	.82
Wyoming	41.2	+1.1	Barnum	88	30	Moran	−20	2	1.60	+.03	Middle Fork	4.48	Deaver	.16
Alaska (March)	17.1	+3.8	Seclusion Harbor	65	1	Allakaket	−52	124	1.59	−.22	Little Port Walter	13.72	Fort Yukon	.00
Hawaii	71.2	+1.2	2 stations	89	114	Kanalohuluhulu	45	15	13.51	+4.78	Puokakamoa No. 2	98.78	Waiopae Ranch	.00
Puerto Rico	72.8	−2.2	4 stations	91	110	Garzas	9	21	2.39	−2.01	La Mina (El Yunque).	9.44	Josefa	.00

[1] Other dates also.

TABLE 2.—*Climatological data for Weather Bureau stations, April 1938*

[Compiled by Annie E. Small, by official authority, U. S. Weather Bureau]

District and station	Elevation of instruments: Barometer above sea level	Elevation of instruments: Thermometer above ground	Elevation of instruments: Anemometer above ground	Pressure: Station, reduced to mean of 24 hours	Pressure: Sea level, reduced to mean of 24 hours	Pressure: Departure from normal	Temperature of the air: Mean max. + mean min. ÷ 2	Temperature of the air: Departure from normal	Temperature of the air: Maximum	Temperature of the air: Date	Temperature of the air: Mean maximum	Temperature of the air: Minimum	Temperature of the air: Date	Temperature of the air: Mean minimum	Temperature of the air: Greatest daily range	Mean wet thermometer	Mean temperature of the dew-point	Mean relative humidity	Precipitation: Total	Precipitation: Departure from normal	Precipitation: Days with 0.01 inch or more	Wind: Average hourly velocity	Wind: Prevailing direction	Wind: Maximum velocity: Miles per hour	Wind: Maximum velocity: Direction	Wind: Maximum velocity: Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month
	Ft.	*Ft.*	*Ft.*	*In.*	*In.*	*In.*	°F.	°F.	°F.		°F.	°F.		°F.	°F.	°F.	°F.	%	*In.*	*In.*		*Miles*								*0–10*	*In.*	*In.*
New England							**46.5**	**+2.6**										**74**	**2.95**	**−0.1**											**5.9**		
Eastport	76	67	85	29.93	30.02	+0.09	40.4	+1.4	81	28	47	16	11	33	43	37	34	83	2.49	−0.4	15	11.0	sw.	35	e.	29	3	6	21	7.5	6.5	0.0
Greenville, Maine	1,069	4	41	28.92	30.02	------	39.6	------	81	27	51	0	11	28	46	33	31	--	2.95	------	16	----	nw.	----	----	----	----	----	----	----	4.0	.0
Portland, Maine	103	82	117	29.90	30.03	+.07	44.6	+1.6	88	28	52	24	11	37	40	39	34	71	2.57	−.8	13	8.5	n.	26	ne.	29	11	8	11	5.3	2.5	.0
Concord	289	54	72	29.71	30.03	+.04	47.7	+4.3	87	28	59	19	11	36	44	----	----	--	2.17	−.6	12	6.4	se.	21	sw.	1	12	10	8	5.0	1.8	.0
Burlington	403	11	48	29.55	30.00	+.01	44.6	+1.3	83	27	54	16	11	35	38	40	34	68	2.31	+.2	12	10.3	s.	40	s.	17	4	9	17	6.9	4.7	.0
Northfield	876	12	60	29.06	30.02	+.03	43.1	+2.8	84	28	55	8	11	31	43	39	33	69	2.01	−.3	13	8.5	s.	27	n.	17	4	9	17	7.3	5.0	.0
Boston [1]	29	33	62	29.99	30.02	+.05	48.7	+2.3	89	28	57	25	6	40	34	42	37	69	3.22	−.1	10	12.2	sw.	31	s.	11	6	10	14	6.6	.9	.0
Nantucket	12	14	90	30.02	30.03	+.06	46.1	+2.7	65	19	52	30	7	40	19	43	41	86	5.72	+2.8	11	15.9	sw.	39	se.	8	11	7	12	5.6	2.3	.0
Block Island	26	11	46	30.01	30.04	+.06	45.8	+1.8	66	15	52	28	6	40	21	43	40	84	3.64	+.1	12	16.0	sw.	36	e.	8	10	13	7	5.0	4.3	.0
Providence	159	215	251	29.86	30.04	+.06	49.7	+3.1	91	28	59	25	6	40	35	43	37	69	2.22	−1.0	13	11.8	nw.	38	nw.	10	13	7	10	5.4	1.1	.0
Hartford	159	66	100	29.87	30.05	+.06	51.0	+4.3	91	28	61	24	6	41	37	----	----	--	3.14	−.2	14	9.0	s.	26	nw.	10	10	12	8	5.0	3.3	.0
New Haven	106	74	153	29.93	30.05	+.06	50.2	+3.0	84	28	59	25	6	42	32	44	39	70	2.98	−.5	14	9.4	s.	29	nw.	10	8	11	11	5.8	4.3	.0
Middle Atlantic States							**54.7**	**+3.3**										**65**	**2.66**	**−0.4**										**5.8**		
Albany	97	97	112	29.92	30.03	+.03	51.0	+4.2	92	28	61	23	6	41	31	43	35	60	2.59	+.1	11	8.0	s.	26	s.	17	7	13	10	5.9	.3	.0
Binghamton	871	57	79	29.10	30.04	+.02	49.1	+3.7	87	28	60	19	6	39	40	43	39	73	2.48	.0	13	7.2	nw.	21	nw.	4	1	9	20	8.0	7.7	.0
New York	314	415	454	29.69	30.03	+.03	53.4	+4.0	85	28	62	29	6	45	28	45	38	62	3.02	−.2	10	14.4	sw.	46	nw.	10	9	13	8	5.7	5.2	.0
Harrisburg	374	94	104	29.64	30.04	+.02	53.4	+2.5	87	28	62	28	6	44	31	46	38	59	2.19	−.5	8	7.9	w.	24	nw.	3	11	6	13	5.7	T	.0
Philadelphia	114	174	367	29.93	30.06	+.05	55.2	+3.1	86	28	64	31	6	46	32	47	39	61	1.92	−1.1	6	13.3	sw.	39	sw.	9	12	7	11	5.4	T	.0
Reading	323	283	306	29.69	30.04	------	54.4	+4.1	88	28	63	29	6	45	31	46	38	59	2.25	−1.0	8	12.0	nw.	41	n.	10	9	10	11	5.5	T	.0
Scranton	805	72	104	29.16	30.03	+.02	50.5	+2.4	87	28	60	22	6	40	37	43	36	61	2.94	+.2	11	7.3	sw.	26	nw.	10	6	13	11	6.1	11.3	.0
Atlantic City	52	37	172	29.99	30.05	+.05	52.0	+4.2	84	15	59	34	6	45	30	46	42	74	2.20	−.8	7	18.2	s.	43	ne.	7	4	15	11	6.5	.0	.0
Sandy Hook	22	10	57	30.01	30.03	------	51.9	+3.6	84	28	59	30	6	45	27	45	41	72	2.31	−1.3	21	13.9	s.	39	nw.	10	7	12	11	5.9	5.3	.0
Trenton	190	89	107	29.84	30.04	------	53.5	+3.7	87	28	64	28	6	43	32	45	39	64	2.31	−.6	9	9.9	s.	28	nw.	10	5	12	13	6.5	.2	.0
Baltimore	123	100	215	29.92	30.05	+.04	56.7	+3.1	87	20	66	33	7	48	32	48	40	58	1.40	−1.9	9	10.7	sw.	43	sw.	9	11	6	13	5.7	T	.0
Washington	112	62	85	29.92	30.04	+.02	57.1	+3.8	87	20	67	33	7	47	35	48	41	61	1.67	−1.6	9	7.5	nw.	26	nw.	10	11	7	12	5.7	T	.0
Cape Henry	18	8	54	30.03	30.05	------	59.2	+4.6	87	20	67	39	4	52	28	54	50	78	5.00	+1.7	11	13.6	sw.	42	nw.	10	11	8	11	5.2	.0	.0
Lynchburg	686	144	184	29.32	30.07	+.05	58.6	+1.3	87	27	70	34	11	47	42	49	42	62	1.60	−1.4	9	7.9	sw.	26	nw.	9	12	5	13	5.3	.0	.0
Norfolk	91	80	125	29.97	30.07	+.06	60.8	+4.0	86	20	70	40	4	52	29	53	48	70	5.78	+2.6	9	11.0	sw.	32	nw.	10	8	9	13	5.9	.0	.0
Richmond	144	11	52	29.91	30.06	+.04	59.7	+3.1	86	15	71	37	11	49	35	51	45	68	2.80	−.7	9	8.8	sw.	32	sw.	9	14	6	10	4.7	.0	.0
Wytheville	2,304	49	55	27.67	30.07	+.04	52.9	+.9	81	26	65	26	3	41	36	46	41	68	2.77	−.2	12	7.4	w.	30	w.	9	15	2	13	5.2	.2	.0
South Atlantic States							**63.2**	**+1.4**										**72**	**3.69**	**+0.7**										**4.7**		
Asheville	2,253	89	104	27.73	30.08	+.05	55.8	+1.9	82	28	68	28	3	43	38	48	44	70	1.47	−1.6	13	8.1	nw.	32	e.	8	10	5	15	5.7	.1	.0
Charlotte	779	63	86	29.24	30.08	+.05	61.2	+1.4	87	29	72	35	10	51	31	53	46	65	3.18	−.1	10	7.9	sw.	30	sw.	9	12	5	13	5.0	T	.0
Greensboro [1]	886	6	56	29.14	30.09	------	57.9	------	85	29	71	29	11	45	41	51	46	72	2.14	------	10	8.6	sw.	29	sw.	9	15	2	13	4.8	.0	.0
Hatteras	11	5	50	30.06	30.07	+.06	62.1	+2.3	76	16	68	44	10	56	19	58	56	86	4.30	+.8	10	13.4	sw.	38	sw.	9	14	10	6	4.4	.0	.0
Raleigh	376	103	140	29.65	30.05	+.02	62.0	+2.6	86	29	73	36	10	51	35	54	48	67	2.94	−.5	12	8.6	sw.	29	w.	9	16	6	8	4.2	.0	.0
Wilmington	72	73	107	30.01	30.09	+.06	64.0	+2.0	81	30	74	41	4	54	32	57	53	75	4.69	+2.0	12	10.0	sw.	30	s.	9	16	7	7	4.2	.0	.0
Charleston	48	11	92	30.05	30.10	+.07	66.3	+1.8	87	30	74	41	10	58	25	60	56	74	2.65	+.1	7	10.1	s.	29	w.	9	14	5	11	4.8	.0	.0
Columbia, S. C	347	70	91	29.71	30.09	+.06	64.0	+.7	87	29	75	36	10	53	33	55	49	66	7.34	+4.4	10	8.2	s.	30	sw.	9	15	4	11	4.3	.0	.0
Greenville, S. C	1,039	139	----	------	30.07	------	59.8	+1.2	86	29	70	34	10	49	34	----	----	--	2.14	−1.6	10	7.4	sw.	27	sw.	9	12	7	11	----	.0	.0
Augusta	182	62	77	29.88	30.07	+.04	64.0	−.2	88	29	76	36	10	52	33	56	52	71	7.81	+4.7	11	5.6	s.	28	nw.	30	13	6	11	4.8	.0	.0
Savannah	65	73	152	30.02	30.10	+.07	67.8	+1.8	91	30	78	38	10	58	30	59	55	74	2.30	−.3	7	10.6	s.	30	nw.	9	15	5	10	4.6	.0	.0
Jacksonville	43	86	110	30.05	30.10	+.06	68.6	−.1	92	30	78	41	10	59	28	61	57	74	1.81	−.6	4	8.2	s.	26	sw.	2	12	12	6	4.8	.0	.0
Florida Peninsula							**73.3**	**+0.8**										**72**	**0.70**	**−1.4**										**4.0**		
Key West	21	10	64	30.01	30.03	+.01	76.8	+1.1	86	2	82	66	10	72	15	69	66	75	.81	−.5	7	11.1	e.	25	w.	9	16	9	5	4.0	.0	.0
Miami	25	124	168	30.04	30.07	+.04	74.3	+1.5	83	8	79	57	10	70	16	67	63	69	.23	−2.9	4	11.2	ne.	24	s.	2	16	8	6	3.7	.0	.0
Tampa	35	88	197	30.04	30.08	+.02	71.6	+.7	87	27	82	48	10	62	28	63	59	71	.35	−1.7	3	12.0	e.	28	s.	8	11	16	3	4.2	.0	.0
Titusville	43	5	36	------	------	------	70.4	+.1	92	8	82	44	4	59	32	63	61	--	1.39	−.7	7	------	se.	----	----	----	7	13	10	----	.0	.0
East Gulf States							**64.8**	**−0.1**										**75**	**7.55**	**+3.4**										**5.3**		
Atlanta [1]	976	5	53	29.05	30.07	+.04	61.4	+.4	85	28	73	32	10	50	35	54	49	72	8.27	+4.7	9	7.8	s.	32	sw.	30	11	5	14	5.4	.0	.0
Macon	370	79	87	29.69	30.08	+.05	63.7	−.2	88	29	75	36	10	53	33	57	52	73	10.25	+7.1	11	6.3	nw.	24	nw.	30	12	9	9	4.8	.0	.0
Thomasville	273	49	58	29.79	30.08	+.05	67.2	+.5	90	30	78	35	10	56	30	60	54	--	3.43	+.1	5	----	e.	----	----	----	----	----	----	----	----	----
Apalachicola	35	11	----	30.04	30.08	------	66.9	−.2	86	30	74	39	10	60	27	63	60	82	2.15	−.6	7	9.5	se.	26	se.	27	11	7	12	5.3	.0	.0
Pensacola	56	149	185	30.01	30.07	+.05	66.7	.0	83	30	73	39	10	61	30	62	59	80	2.80	−1.2	4	12.8	se.	40	sw.	8	10	16	4	4.2	.0	.0
Anniston	741	9	----	------	------	------	61.1	+.7	85	28	70	29	10	52	31	----	----	--	13.17	+8.8	9	------	nw.	----	----	----	13	7	10	----	.0	.0
Birmingham	700	11	48	29.32	30.06	+.04	62.9	−.4	85	29	72	36	10	53	31	55	50	69	11.58	+6.8	14	7.3	se.	20	se.	6	12	5	13	5.0	.0	.0
Mobile	57	86	161	30.00	30.06	+.04	66.4	+.1	86	29	76	38	10	57	27	60	57	79	2.37	−2.3	7	9.6	s.	35	s.	7	8	11	11	5.7	.0	.0
Montgomery	218	92	105	29.82	30.08	+.05	64.8	−.5	88	30	74	37	10	55	29	58	53	71	9.60	+5.3	9	7.0	se.	18	w.	8	11	6	13	5.4	.0	.0
Meridian	375	67	92	29.66	30.05	+.03	64.2	+.2	88	30	74	33	10	54	31	57	53	75	16.44	+11.7	10	6.0	s.	20	s.	17	13	4	13	5.2	.0	.0
Vicksburg	247	82	102	29.77	30.03	+.03	64.0	−1.6	86	30	73	38	9	55	26	57	53	73	7.61	+2.4	13	8.8	se.	37	ne.	7	10	7	13	6.1	.0	.0
New Orleans	53	76	84	30.00	30.05	+.05	68.6	−.2	86	30	76	42	9	61	23	62	59	77	2.93	−2.3	9	7.5	se.	20	s.	7	6	12	12	5.9	.0	.0
West Gulf States							**65.8**	**−0.7**										**74**	**3.85**	**+0.2**										**5.8**		
Shreveport	249	92	227	29.74	30.01	+.04	65.5	−.3	89	29	75	36	8	56	28	58	54	74	6.51	+1.9	9	11.9	se.	52	n.	21	11	10	9	5.4	.0	.0
Bentonville	1,303	12	38	28.64	30.01	+.05	59.1	+2.2	87	30	69	28	2	49	35	----	----	--	3.91	−.4	7	8.5	s..	27	nw.	6	11	8	11	----	.2	.0
Fort Smith	457	57	82	29.52	30.00	+.04	62.6	+.8	88	30	72	35	9	53	31	54	47	62	4.79	+.8	7	8.3	e.	28	s.	27	11	7	12	5.3	T	.0
Little Rock	357	94	102	29.63	30.01	+.03	62.8	+.7	87	30	72	34	3	54	29	55	49	67	4.04	−1.2	7	8.4	s.	27	c.	7	9	10	11	5.3	.0	.0
Austin	605	68	90	29.34	29.97	------	65.5	−2.3	86	6	75	34	10	56	35	60	56	76	4.96	+.6	8	9.2	s.	30	nw	7	7	10	13	6.0	.0	.0
Brownsville	57	88	96	29.87	29.93	------	73.2	−.5	89	15	80	42	9	66	25	66	62	77	.96	−.5	3	12.6	se.	37	nw.	8	7	14	9	5.6	.0	.0
Corpus Christi	20	11	78	29.94	29.96	+.01	70.6	−.2	83	21	76	42	9	65	28	65	62	80	1.81	.0	3	13.4	se.	33	n.	7	7	11	12	6.3	.0	.0
Dallas	512	220	227	29.43	29.98	------	63.0	------	85	6	72	32	8	54	38	57	52	71	3.07	−1.2	10	13.0	se.	42	n.	6	11	5	14	5.5	.1	.0
Fort Worth	679	92	110	29.27	29.98	+.04	63.2	−1.8	88	6	73	32	8	53	42	----	----	--	3.03	−1.0	11	11.7	s.	43	n.	21	11	10	9	4.3	T	.0
Galveston	54	106	114	29.95	30.01	+.04	67.4	−1.3	80	29	72	38	8	63	31	63	61	84	4.41	+1.4	6	12.6	se.	38	nw.	7	7	10	13	6.2	.0	.0
Houston	138	292	314	29.86	30.01	------	67.4	−1.9	86	30	75	37	8	60	32	----	----	--	2.41	−1.2	12	13.6	se.	35	nw.	8	5	10	15	6.9	.0	.0
Palestine	510	64	72	29.48	30.01	+.05	65.0	−1.0	85	29	74	34	8	56	35	58	54	73	3.78	−.6	7	8.6	s.	29	nw.	7	9	7	14	5.9	T	.0
Port Arthur	34	98	106	29.98	30.02	------	67.8	------	85	29	75	37	8	61	37	----	----	--	4.17	+1.2	6	14.9	s.	35	se.	14	9	9	12	6.1	.0	.0
San Antonio	693	111	301	29.25	29.96	+.03	66.7	−2.4	88	6	76	36	8	58	32	61	56	74	6.06	+2.9	10	12.8	se.	53	w.	7	4	17	9	6.1	.0	.0

See footnotes at end of table.

TABLE 2.—*Climatological data for Weather Bureau stations, April 1938*—Continued

[Compiled by Annie E. Small, by official authority, U. S. Weather Bureau]

District and station	Elevation of instruments: Barometer above sea level	Elevation of instruments: Thermometer above ground	Elevation of instruments: Anemometer above ground	Pressure: Station, reduced to mean of 24 hours	Pressure: Sea level, reduced to mean of 24 hours	Pressure: Departure from normal	Temperature of the air: Mean max.+mean min.÷2	Temperature of the air: Departure from normal	Temperature of the air: Maximum	Temperature of the air: Date	Temperature of the air: Mean maximum	Temperature of the air: Minimum	Temperature of the air: Date	Temperature of the air: Mean minimum	Temperature of the air: Greatest daily range	Mean wet thermometer	Mean temperature of the dew-point	Mean relative humidity	Precipitation: Total	Precipitation: Departure from normal	Precipitation: Days with 0.01 inch or more	Wind: Average hourly velocity	Wind: Prevailing direction	Wind: Maximum velocity: Miles per hour	Wind: Maximum velocity: Direction	Wind: Maximum velocity: Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month
Ohio Valley and Tennessee	*Ft.*	*Ft.*	*Ft.*	*In.*	*In.*	*In.*	°F.	°F.	°F.		°F.	°F.		°F.	°F.	°F.	°F.	%	*In.*	*In.*		*Miles*								0–10	*In.*	*In.*
							57.5	+2.6										64	3.54	−0.2											5.5		
Chattanooga	762	71	214	29.25	30.06	+0.03	62.0	+1.7	86	26	72	33	3	52	32	53	47	63	8.45	+3.6	11	7.1	s.	34	w.	7	11	8	11	5.1	0.0	0.0
Knoxville	995	66	84	29.00	30.06	+.03	61.1	+3.1	86	26	72	32	3	50	33	52	46	67	6.52	+2.4	13	5.7	sw.	23	w.	9	14	7	9	4.5	T	.0
Memphis	399	78	86	29.60	30.02	+.02	63.2	+1.4	83	28	71	37	9	56	24	55	49	65	5.90	+1.1	8	9.0	sw.	24	n.	30	8	10	12	5.7	.0	.0
Nashville	546	168	188	29.47	30.06	+.05	61.6	+2.6	83	26	71	31	3	52	27	54	48	65	2.23	−1.9	10	9.5	s.	33	se.	8	8	13	9	5.2	.0	.0
Lexington	989	6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Louisville	525	188	234	29.46	30.04	+.03	59.2	+2.8	85	26	68	31	3	50	29	50	44	62	2.01	−1.9	10	11.6	s.	28	w.	18	9	8	13	5.7	T	.0
Evansville	431	76	116	29.55	30.02	+.02	59.5	+2.8	87	26	69	33	9	50	28	50	44	62	.81	−3.1	10	10.6	sw.	36	sw.	3	9	10	11	5.5	T	.0
Indianapolis	822	194	230	29.14	30.03	+.03	54.0	+1.9	84	26	63	27	3	45	30	46	38	59	3.24	−.4	9	12.7	s.	32	n.	9	4	17	9	6.5	1.6	.0
Terre Haute	575	63	149	29.38	30.00	.....	56.4	.....	85	26	66	30	3	47	30	47	40	60	3.11	−.6	11	11.8	s.	29	sw.	3	7	15	8	5.7	3.0	.0
Cincinnati	627	11	51	29.36	30.04	+.03	56.4	+4.0	84	26	66	30	3	47	32	48	42	65	2.07	−1.0	13	8.8	sw.	24	sw.	3	10	7	13	5.9	.4	.0
Columbus	822	90	210	29.15	30.03	+.01	54.4	+3.2	84	27	64	30	10	45	30	47	40	64	3.07	+.2	10	10.8	s.	35	sw.	17	11	7	12	5.2	T	.0
Dayton	899	60	163	29.07	30.03	.....	54.8	+3.2	82	27	64	30	3	45	32	.....	.....	.....	2.78	−.4	10	10.9	sw.	39	sw.	28	9	11	10	5.5	T	.0
Elkins	1,947	65	83	28.01	30.07	+.04	52.4	+3.6	83	28	65	25	10	40	40	45	39	67	2.62	−1.0	14	7.4	w.	34	w.	18	6	12	12	6.1	3.4	.0
Parkersburg	637	77	84	29.35	30.03	.00	56.4	+3.0	87	27	68	31	10	45	36	48	42	64	3.43	+.2	9	6.9	sw.	30	nw.	18	13	8	9	4.6	T	.0
Pittsburgh [1]	1,273	39	54	28.67	30.03	+.01	52.2	+1.0	86	27	62	27	3	42	35	44	38	65	3.27	+.4	13	11.9	sw.	34	nw.	18	8	9	13	6.3	2.0	.0
Lower Lake Region							48.2	+2.9										68	2.70	+0.2									6.5		
Buffalo	768	243	280	29.17	30.02	+.01	45.5	+2.7	73	28	53	23	6	38	30	40	36	74	2.02	−.5	16	16.7	sw.	40	sw.	1	8	8	14	6.5	6.9	.0
Canton	448	10	61	29.51	29.99	.....	44.4	+1.9	79	28	54	15	11	35	39	40	35	70	2.93	+.8	14	10.7	w.	32	sw.	11	6	7	17	6.8	10.1	.0
Ithaca	836	77	100	29.11	30.02	.....	48.2	+3.2	88	28	58	19	6	38	35	42	36	66	2.52	.0	15	9.9	nw.	31	se.	17	5	9	16	6.9	7.1	.0
Oswego	335	71	85	29.64	30.02	+.01	46.0	+2.4	82	27	54	22	5	38	35	41	36	68	2.60	+.3	12	9.8	w.	32	n.	9	7	5	18	7.1	6.8	.0
Rochester	523	86	102	29.45	30.03	+.02	47.8	+2.9	83	27	55	24	6	40	32	41	34	63	2.39	.0	11	9.7	sw.	28	w.	1	8	6	16	6.7	8.3	.0
Syracuse	596	65	75	29.38	30.03	+.02	48.8	+4.1	86	28	58	23	6	40	37	.....	.....	.....	3.09	+.6	16	8.1	w.	27	s.	17	2	10	18	7.4	11.2	.0
Erie	714	130	166	29.25	30.02	.00	49.0	+3.9	83	27	57	27	3	41	31	43	38	70	3.61	+.9	14	14.2	w.	38	se.	17	6	14	10	6.0	5.9	.0
Cleveland	762	267	318	29.19	30.02	.00	50.3	+4.1	84	27	58	26	3	42	30	44	38	66	2.70	+.3	14	16.2	sw.	51	w.	3	9	10	11	5.6	8.4	.0
Sandusky	629	5	67	29.34	30.03	+.01	50.1	+2.9	87	27	59	25	5	41	31	.....	.....	.....	2.11	−.4	9	11.4	sw.	27	w.	3	5	13	12	6.1	4.4	.0
Toledo	628	79	87	29.34	30.03	+.02	49.8	+2.2	84	27	58	26	3	42	29	43	37	66	3.00	+.4	9	11.9	sw.	31	w.	1	8	13	9	5.5	6.7	.0
Fort Wayne	857	69	84	29.10	30.03	.....	50.6	+2.2	82	27	60	26	3	41	33	44	38	67	3.60	+.5	14	11.2	sw.	32	w.	3	4	14	12	6.3	1.6	.0
Detroit [1]	626	5	78	29.32	30.02	.00	48.2	+2.0	84	27	57	23	6	39	35	42	36	67	1.86	−.6	10	12.4	sw.	34	sw.	19	2	14	14	6.9	3.9	.0
Upper Lake Region							43.9	+2.3										70	1.91	−0.6									6.9		
Alpena	609	13	89	29.33	30.00	−.02	42.5	+3.9	86	27	51	19	5	34	40	37	32	71	.98	−1.3	15	12.1	nw.	31	sw.	19	4	13	13	6.6	1.7	.0
Escanaba	612	41	49	29.33	30.00	−.02	40.4	+2.5	66	19	48	19	6	33	26	36	31	74	1.65	−.6	13	11.6	s.	29	ne.	8	4	7	19	7.4	.5	.0
Grand Rapids	707	70	244	29.24	30.02	.00	48.2	+1.2	82	27	57	23	5	40	31	42	37	71	1.49	−1.3	14	14.2	sw.	53	sw.	19	6	10	14	6.8	8.7	.0
Lansing	878	5	90	29.06	30.01	.....	47.2	+1.6	83	27	56	21	5	38	34	42	37	73	1.42	−1.2	8	10.7	sw.	26	sw.	19	4	13	13	6.7	9.3	.0
Ludington	637	5	54	29.29	30.00	.....	43.7	+1.8	74	26	51	22	5	36	28	39	33	.....	.24	−2.3	6	.....	s.	.....	.....	.....	6	12	12	.....	.4	.0
Marquette	734	44	69	29.18	29.99	−.03	39.4	+1.6	86	27	47	16	6	32	46	36	32	77	3.31	+.9	15	8.9	nw.	26	nw.	1	4	9	17	7.2	3.6	.0
Sault Sainte Marie	614	11	52	29.31	30.02	−.01	38.7	+1.3	78	27	46	14	5	31	31	34	29	72	2.64	+.4	15	9.5	nw.	31	nw.	1	5	7	18	7.2	1.2	.0
Chicago	673	7	131	29.28	30.02	+.02	50.2	+3.3	83	27	58	27	3	42	39	43	37	65	2.20	−.6	10	12.6	sw.	34	ne.	8	9	6	15	6.3	13.6	.0
Green Bay	617	109	141	29.31	29.98	−.03	45.9	+2.7	80	27	55	22	4	37	34	40	32	62	1.68	−1.0	9	13.0	s.	31	ne.	6	5	2	23	7.7	.1	.0
Milwaukee	681	97	221	29.25	30.00	+.01	47.2	+3.4	83	27	55	27	3	40	27	41	36	68	.97	−1.7	7	14.6	sw.	37	sw.	19	7	7	16	6.9	.3	.0
Duluth	1,133	5	47	28.73	29.97	−.04	39.0	+2.0	71	30	49	10	2	29	35	34	29	72	4.48	+2.4	14	13.0	ne.	39	w.	19	5	14	11	6.2	T	.0
North Dakota							43.1	+2.1										60	1.56	0.0									5.8		
Moorhead, Minn	940	50	58	28.95	29.98	−.01	43.6	+3.0	82	30	56	12	5	31	41	37	29	62	2.07	−.1	11	9.6	n.	30	nw.	19	5	7	18	7.1	.1	.0
Bismarck	1,674	8	57	28.18	29.98	+.01	46.3	+4.2	83	30	58	16	2	34	38	38	27	54	.54	−1.0	7	10.1	nw.	30	nw.	19	7	14	9	5.4	.1	.0
Devils Lake	1,478	11	44	28.40	30.00	+.01	41.4	+2.6	74	18	54	11	5	29	36	35	27	64	2.79	+1.3	10	10.4	nw.	35	nw.	19	9	8	13	6.2	.1	.0
Grand Forks	833	12	67	.....	.....	.....	41.0	−.7	77	30	54	9	4	28	42	36	29	.....	1.49	−.1	12	10.4	nw.	.....	.....	.....	7	10	13	6.0	.....	.0
Williston	1,878	42	50	27.99	30.00	+.04	43.4	+1.4	77	29	54	10	1	33	36	36	28	61	.90	−.3	4	8.8	nw.	31	nw.	20	16	7	7	4.2	T	.0
Upper Mississippi Valley							52.3	+1.9										64	3.10	+0.1									6.2		
Minneapolis-St. Paul, Minn	919	105	208	29.02	29.96	−.03	46.0	−.4	80	26	56	17	2	36	34	40	33	65	3.27	+1.0	10	12.9	nw.	39	nw.	19	6	9	15	7.0	T	.0
La Crosse	714	11	48	29.21	29.99	+.01	48.7	+1.5	80	26	58	23	2	40	34	42	34	63	3.01	+.6	11	7.3	s.	19	sw.	16	6	11	13	6.7	.6	.0
Madison	974	70	78	28.93	29.99	.00	47.7	+2.3	80	27	56	23	2	39	33	42	35	64	1.65	−1.1	9	11.1	nw.	34	ne.	8	6	6	18	7.2	1.3	.0
Charles City	1,015	10	51	28.90	30.00	+.02	48.2	+1.8	80	13	58	21	2	39	35	42	36	68	4.87	+2.4	11	8.4	nw.	25	s.	10	8	9	13	6.0	10.0	.0
Davenport	606	66	161	29.34	30.01	+.03	52.6	+2.7	82	26	61	27	2	44	28	44	37	59	3.23	+.5	8	12.5	sw.	34	w.	3	6	12	12	6.0	1.6	.0
Des Moines	861	5	99	29.07	29.98	+.01	51.6	+1.5	81	26	60	25	2	43	34	45	39	66	4.21	+1.3	12	11.6	s.	30	n.	8	7	11	12	6.2	1.9	.0
Dubuque	699	60	79	29.24	29.99	+.01	50.8	+2.2	82	26	60	25	2	42	29	43	35	60	2.01	−.8	11	8.0	nw.	21	ne.	8	8	8	14	6.4	5.7	.0
Keokuk	614	64	78	29.34	30.00	+.02	54.1	+1.8	82	26	63	27	9	45	26	46	39	61	3.17	+.2	11	10.1	sw.	27	nw.	3	5	8	17	6.9	2.8	.0
Cairo	358	87	93	29.63	30.01	+.02	61.0	+2.9	83	26	70	34	3	52	25	53	47	65	1.27	−2.4	10	10.2	s.	28	s.	3	8	8	14	6.1	T	.0
Peoria	609	11	45	29.34	30.01	+.02	53.3	+2.4	84	19	63	23	9	44	29	45	39	65	3.80	+.4	10	9.1	s.	27	ne.	6	9	12	9	5.2	6.2	.0
Springfield, Ill	636	5	191	29.32	30.00	+.02	55.4	+2.7	87	19	65	29	9	46	32	47	41	64	3.32	−.2	13	13.5	s.	40	sw.	27	8	10	12	6.0	.1	.0
St. Louis	568	179	303	29.38	29.99	+.01	57.8	+1.7	88	19	67	31	9	49	36	49	42	62	3.34	−.5	13	13.5	sw.	34	sw.	27	11	13	6	4.8	.3	.0
Missouri Valley							53.5	+2.2										64	3.75	+0.9									5.6		
Columbia, Mo	784	6	66	29.14	29.98	.00	56.2	+1.3	85	19	66	23	9	47	32	.....	.....	.....	4.74	+1.0	9	9.6	s.	30	n.	29	8	14	8	5.4	5.8	.0
Kansas City [1]	750	32	45	29.16	29.97	+.01	56.4	+1.6	86	30	66	27	2	47	35	48	42	65	1.87	−1.3	8	12.3	sw.	33	w.	27	9	9	12	5.8	7.0	.0
St. Joseph	967	11	49	28.93	29.97	.....	54.7	.....	83	26	64	26	2	45	34	47	40	63	3.18	.0	10	11.1	s.	36	w.	27	11	6	13	5.4	4.0	.0
Springfield, Mo	1,324	98	104	28.57	29.98	+.01	57.7	+1.7	84	30	67	26	9	48	31	50	44	65	3.50	−.4	10	11.5	s.	31	s.	27	11	10	9	4.9	2.0	.0
Topeka	987	65	87	28.90	29.96	.....	56.3	+1.6	88	30	67	25	2	46	36	48	41	65	2.01	−.8	9	11.4	s.	32	sw.	27	11	10	9	5.2	6.5	.0
Lincoln	1,189	11	81	28.68	29.95	+.01	54.1	+2.6	87	30	64	23	2	44	35	46	38	62	3.63	+1.1	11	12.3	s.	35	n.	8	9	13	8	5.3	.4	.0
Omaha [1]	982	31	44	28.91	29.96	+.01	53.4	+2.2	85	30	64	24	2	43	39	46	39	63	5.19	+2.7	9	14.4	s.	36	n.	8	6	12	12	6.3	T	.0
Valentine	2,598	47	54	27.26	29.99	+.05	47.4	+1.7	86	30	59	8	8	36	36	40	33	64	4.40	+2.6	8	11.1	nw.	36	s.	22	9	8	13	5.7	6.4	.0
Sioux City	1,138	64	106	28.74	29.96	+.01	51.6	+3.8	82	18	62	23	2	42	36	44	37	62	3.19	+.5	10	12.3	nw.	32	nw.	19	7	7	16	6.5	4.0	.0
Huron	1,307	59	74	28.57	29.98	+.02	48.1	+3.0	85	30	59	17	8	37	37	42	35	65	5.78	+3.5	9	11.1	nw.	33	nw.	19	8	11	11	6.0	12.4	.0

See footnotes at end of table.

TABLE 2.—*Climatological data for Weather Bureau Stations, April 1938*—Continued

District and station	Elevation of			Pressure			Temperature of the air										Mean wet thermometer	Mean temperature of the dew-point	Mean relative humidity	Precipitation			Wind				Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month
	Barometer above sea level	Thermometer above ground	Anemometer above ground	Station, reduced to mean of 24 hours	Sea level, reduced to mean of 24 hours	Departure from normal	Mean max.+mean min.÷2	Departure from normal	Maximum	Date	Mean maximum	Minimum	Date	Mean minimum	Greatest daily range					Total	Departure from normal	Days with 0.01 inch or more	Average hourly velocity	Prevailing direction	Maximum velocity: Miles per hour	Maximum velocity: Direction	Maximum velocity: Date					
	Ft.	*Ft.*	*Ft.*	*In.*	*In.*	*In.*	°F.	°F.	°F.		°F.	°F.		°F.	°F.		°F.	°F.	%	*In.*	*In.*		*Miles*							*0–10*	*In.*	*In.*
Northern Slope							**45.0**	**+1.6**											**60**	**1.52**	**0.0**									**6.4**		
Havre	2,507	11	67	27.34	30.00	+0.07	44.6	+.9	79	29	57	1	1	32	40		37	28	59	.29	−.7	3	10.3	e.	29	w.	18	7	9	14	6.1	0.1	0.0
Helena	4,124	85	111	25.78	30.01	+.04	44.0	+.5	75	29	55	5	1	33	33		37	29	60	.61	−.5	9	8.0	sw.	31	w.	18	5	5	20	7.4	4.0	.0
Missoula	3,263	80	91	.....	.....	.....	47.5	+2.3	81	30	59	23	1	36	40		.....	.....	.....	.74	−.3	8	7.2	se.	32	e.	24	3	10	17	7.2	T	.0
Kalispell	2,973	48	56	26.92	29.99	+.03	45.4	+1.8	76	30	57	24	1	34	36		39	31	60	.37	−.4	8	6.4	w.	24	nw.	18	3	10	17	7.1	T	.0
Miles City	2,371	48	55	27.46	29.97	+.01	47.2	+2.5	85	30	59	16	2	35	43		39	29	55	.41	−.7	4	7.6	s.	30	nw.	18	6	9	15	6.5	T	.0
Rapid City	3,259	50	58	26.58	29.97	+.02	46.0	+1.7	86	30	57	12	7	35	38		39	32	60	3.07	+1.0	6	9.2	n.	31	n.	18	7	17	6	5.4	9.8	.0
Cheyenne [1]	6,144	5	39	23.89	29.93	+.02	42.5	+1.6	76	25	56	5	1	29	41		35	29	64	2.11	+.1	12	13.6	nw.	35	nw.	10	7	11	12	6.0	10.0	.0
Lander	5,352	60	68	24.60	29.93	−.01	44.2	+1.8	80	29	57	10	7	31	42		35	24	51	2.88	+.8	8	6.0	sw.	34	sw.	30	4	13	13	6.3	18.1	.0
Sheridan	3,790	10	47	26.07	29.99	.....	44.8	.....	80	30	58	8	7	31	48		38	30	61	1.34	−.6	10	5.7	nw.	22	nw.	17	8	8	14	6.0	5.2	.0
Yellowstone Park	6,241	12	46	23.85	30.05	+.09	38.4	+1.8	71	30	49	2	1	28	41		32	26	63	1.32	+.2	13	8.0	sw.	26	sw.	17	6	8	16	6.6	2.3	.0
North Platte	2,821	11	51	27.01	29.95	+.03	50.2	+1.6	83	30	63	16	8	38	38		43	36	66	3.60	+1.5	11	9.5	n.	37	ne.	27	9	9	12	5.5	3.3	.0
Middle Slope							**53.8**	**+0.4**											**62**	**2.50**	**+0.2**									**5.0**		
Denver	5,292	106	113	24.66	29.92	+.02	49.1	+2.0	83	25	62	12	7	36	39		38	27	53	2.66	+.6	10	9.3	s.	41	n.	26	6	13	11	6.0	7.3	.0
Pueblo	4,685	80	86	25.22	29.89	+.01	51.2	+1.1	87	25	67	18	7	36	49		40	27	49	1.63	+.3	6	8.1	nw.	35	nw.	5	11	12	7	4.8	3.7	.0
Concordia	1,392	50	58	28.48	29.96	+.03	53.5	.0	87	30	64	22	2	43	33		47	41	66	1.61	−.8	11	11.5	s.	29	sw.	13	12	13	5	4.6	6.0	.0
Dodge City	2,509	10	86	27.33	29.93	+.03	53.1	−.5	86	29	64	21	7	42	36		46	40	68	3.20	+1.3	10	15.2	s.	37	n.	7	9	12	9	5.2	14.3	.0
Wichita	1,358	85	93	28.51	29.92	−.01	56.7	+.3	85	30	67	26	2	47	33		50	43	65	2.85	−.1	8	12.4	se.	35	sw.	27	13	9	8	4.7	6.2	.0
Oklahoma City	1,214	10	47	28.68	29.95	+.03	59.2	−.6	88	18	70	27	7	49	39		52	47	70	3.06	−.2	9	12.3	s.	32	n.	8	12	8	10	4.9	4.1	.0
Southern Slope							**61.9**	**−1.0**											**54**	**0.98**	**−0.8**									**4.7**		
Abilene	1,738	10	52	28.15	29.95	+.05	63.2	−1.2	88	30	75	27	8	51	45		53	46	62	1.62	−1.1	8	12.3	s.	30	nw.	8	10	12	8	5.3	2.9	.0
Amarillo	3,676	10	49	26.21	29.92	+.05	56.6	+.8	89	30	70	20	8	43	40		45	35	53	1.07	−.8	7	12.2	s.	34	sw.	14	10	10	10	5.3	5.1	.0
Del Rio	960	63	71	28.93	29.91	+.02	68.4	−2.2	91	16	79	38	8	58	35		59	52	62	1.10	−.7	5	11.6	se.	40	nw.	8	12	11	7	4.7	.0	.0
Roswell	3,566	75	85	26.31	29.89	+.04	59.4	−1.2	91	19	75	23	2	44	46		46	31	41	.12	−.8	2	11.0	s.	38	sw.	26	15	12	3	3.5	.0	.0
Southern Plateau							**58.0**	**+1.1**											**35**	**0.16**	**−0.4**									**3.3**		
El Paso	3,778	82	101	26.13	29.87	+.04	63.8	+.4	90	25	78	30	8	50	42		45	22	23	T	−.3	0	9.1	nw.	26	sw.	30	20	10	0	2.5	.0	.0
Albuquerque [1]	4,972	5	39	24.98	29.85	.....	54.4	+.4	84	24	71	20	2	38	44		40	23	37	.20	−.4	5	10.2	s.	44	w.	26	12	11	7	4.5	.1	.0
Santa Fe	7,013	38	53	23.19	29.89	+.05	48.4	+1.7	74	24	62	16	7	35	34		36	21	40	.56	−.5	6	7.3	se.	26	sw.	26	11	10	9	4.9	3.4	.0
Flagstaff	6,907	10	59	23.29	29.84	.00	43.8	+1.6	74	19	59	15	1	29	44		35	.....	49	.40	−.9	2	10.6	sw.	35	nw.	15	8	18	4	.....	4.0	.0
Phoenix	1,107	39	51	28.72	29.86	−.01	69.0	+2.0	99	18	84	38	1	54	43		50	32	30	T	−.4	0	7.4	e.	23	sw.	5	19	8	3	3.1	.0	.0
Yuma	141	9	54	29.74	29.88	−.01	70.8	+1.3	102	19	87	43	1	55	45		53	35	33	T	−.1	0	7.2	w.	26	nw.	29	26	4	0	1.3	.0	.0
Independence	3,957	5	26	.....	.....	.....	55.6	+.5	84	17	69	29	1	42	36		42	26	...	T	−.1	0	.....	n.	.....	.....	.....	20	7	3	.....	.0	.0
Middle Plateau							**49.4**	**+1.2**											**51**	**1.02**	**+0.2**									**6.3**		
Reno	4,527	61	76	25.44	29.97	.00	49.0	+1.5	77	18	61	24	1	37	39		39	29	51	.31	−.2	4	8.1	w.	30	w.	24	6	15	9	5.9	T	.0
Tonopah	6,090	12	20	.....	.....	.....	47.6	.....	76	18	59	20	6	36	38		38	27	51	1.11	.....	4	11.5	nw.	36	nw.	13	11	12	7	.....	8.0	.0
Winnemucca	4,344	18	56	25.58	29.97	+.01	48.0	+1.3	80	18	61	15	1	35	39		40	30	57	2.38	+1.5	10	8.0	sw.	24	nw.	9	3	8	19	7.7	T	.0
Modena	5,473	10	43	24.55	29.87	−.01	47.2	+1.2	79	18	63	19	1	32	44		37	26	49	.63	−.3	5	10.9	sw.	41	s.	25	8	13	9	5.8	4.6	.0
Salt Lake City [1]	4,227	32	46	25.68	29.92	.00	50.0	.....	82	29	62	22	2	38	38		41	30	50	1.13	.....	7	9.6	se.	36	se.	24	3	16	11	6.3	T	.0
Grand Junction	4,602	60	68	25.31	29.87	−.01	53.2	+.8	81	29	66	23	7	41	34		42	30	46	.74	−.1	6	7.6	se.	34	s.	5	10	9	11	5.6	.6	.0
Northern Plateau							**50.9**	**+1.6**											**55**	**0.83**	**−0.3**									**6.1**		
Baker	3,471	36	54	26.44	30.02	+.02	46.8	+1.6	77	29	59	22	1	35	35		40	33	62	.56	−.5	9	6.7	n.	20	nw.	13	6	5	19	7.2	T	.0
Boise	2,739	79	87	27.14	30.00	+.02	51.8	+1.4	80	29	63	25	1	41	32		43	34	55	1.09	−.1	12	6.4	se.	30	se.	30	5	9	16	6.6	.0	.0
Pocatello	4,477	60	68	25.42	29.94	.00	48.8	+2.8	80	29	60	22	1	38	37		40	30	51	1.22	−.2	6	9.2	se.	32	s.	30	4	14	12	6.1	2.7	.0
Spokane	1,929	101	110	27.95	30.00	+.01	49.8	+1.4	77	30	61	28	1	39	35		42	34	60	.35	−.8	8	6.6	s.	20	sw.	16	9	9	12	5.7	.0	.0
Walla Walla	991	57	65	28.94	30.01	.00	54.2	+1.1	81	29	65	33	1	44	30		46	37	55	1.43	−.1	9	6.1	s.	17	w.	16	10	8	12	5.5	.0	.0
Yakima	1,076	58	67	28.85	30.01	.....	53.8	+1.3	81	30	66	28	1	42	31		44	32	47	.34	−.1	3	6.5	nw.	23	nw.	25	9	11	10	5.7	.0	.0
North Pacific Coast Region							**52.0**	**+2.5**											**72**	**2.75**	**−0.3**									**7.2**		
North Head	211	11	56	29.86	30.09	+.04	49.8	+2.3	72	7	54	41	13	45	21		46	43	82	5.37	+1.2	15	14.2	nw.	42	s.	15	3	12	15	7.3	.0	.0
Seattle	125	90	321	29.91	30.04	+.01	53.4	+4.0	75	7	62	36	1	45	32		47	40	65	1.64	−.7	14	9.1	se.	34	sw.	8	4	12	14	6.7	.0	.0
Tacoma	194	172	201	.....	.....	.....	51.9	+3.2	72	28	60	34	1	44	...		.....	.....	.....	2.88	+.1	11	8.1	sw.	27	w.	8	4	15	11	.....	.0	.0
Tatoosh Island	86	10	54	29.96	30.06	+.06	49.0	+2.9	64	7	53	41	6	45	18		45	42	79	4.12	−1.5	15	11.5	e.	34	e.	7	3	10	17	7.3	.0	.0
Medford [1]	1,329	29	58	28.64	30.06	.....	52.4	+.3	79	29	64	29	1	41	40		46	40	70	1.32	+.1	15	.....	nw.	.....	.....	.....	2	14	14	7.2	T	.0
Portland, Oreg	153	68	106	29.90	30.06	.00	54.4	+2.6	75	29	63	38	6	45	28		48	41	63	2.02	−.8	11	6.7	nw.	21	ne.	7	3	10	17	7.3	.0	.0
Roseburg	510	45	76	29.51	30.07	.00	53.3	+2.3	80	7	64	31	1	42	45		48	43	72	1.90	−.4	15	4.3	n.	15	n.	19	1	11	18	7.7	.0	.0
Middle Pacific Coast Region							**55.8**	**0.0**											**71**	**2.06**	**−0.2**									**7.0**		
Eureka	62	73	89	30.04	30.11	.00	52.0	+2.1	65	16	57	39	6	47	17		48	45	80	2.23	−1.1	16	7.7	n.	22	n.	13	2	7	21	8.1	.0	.0
Redding [1]	722	20	34	.....	.....	.....	58.1	−1.7	84	18	67	38	5	49	29		49	40	58	2.99	+.4	12	7.5	nw.	24	nw.	23	6	4	20	7.5	.0	.0
Sacramento	66	92	115	29.96	30.03	+.02	58.0	−.1	84	18	68	41	1	48	26		51	46	69	1.51	.0	6	7.5	s.	24	nw.	6	8	10	12	5.8	.0	.0
San Francisco	155	112	132	29.89	30.06	+.01	54.9	−.1	75	18	60	46	1	50	22		50	47	77	1.52	−.1	5	9.3	w.	26	w.	10	4	13	13	6.5	.0	.0
South Pacific Coast Region							**60.8**	**+1.4**											**66**	**0.75**	**−0.2**									**5.2**		
Fresno	327	97	105	29.67	30.03	+.04	60.8	+.6	86	18	72	41	1	50	30		52	45	63	1.32	+.4	7	6.5	nw.	26	sw.	24	6	15	9	5.8	.0	.0
Los Angeles	338	159	191	29.63	30.00	+.01	61.6	+2.2	90	18	70	48	14	53	29		53	46	64	.48	−.6	6	6.2	sw.	22	nw.	5	13	10	7	4.6	.0	.0
San Diego	87	62	70	29.90	29.99	.00	60.0	+1.5	80	7	66	47	1	54	31		53	49	71	.44	−.3	6	7.4	w.	22	w.	13	12	7	11	5.1	.0	.0
West Indies																																
San Juan, P. R	82	9	54	29.93	30.02	.....	74.7	−1.9	81	10	78	67	21	71	11		.....	.....	...	1.72	−2.6	15	14.6	e.	28	ne.	1	14	16	0	3.5	.0	.0
Panama Canal																																
Balboa Heights	118	6	92	.....	[3]29.84	+.02	81.0	−.6	93	6	90	69	17	72	23		.....	.....	[3]75	1.93	−1.0	7	6.8	nw.	24	nw.	14	3	25	2	4.9	.0	.0
Cristobal	36	6	97	.....	[3]29.87	+.01	81.3	−.5	90	24	86	72	17	76	15		74	72	[3]74	6.25	+2.1	14	12.0	n.	24	n.	5	6	13	11	6.2	.0	.0
Alaska																																
Fairbanks	454	11	87	[3]29.25	[3]29.78	.....	34.2	+5.5	58	29	46	7	20	22	36		29	18	52	.10	−.2	4	6.0	n.	21	s.	28	14	9	7	4.3	1.8	.0
Juneau	80	96	116	[3]29.79	[3]29.88	.....	42.0	+1.6	57	26	48	31	1	36	24		38	33	73	5.71	+.4	18	6.7	se.	26	se	13	3	7	20	7.8	.1	.0
Nome	22	5	32	.....	[3]29.72	.....	32.0	+13.2	49	13	38	13	19	26	.....		.....	.....	80	.61	.0	11	8.6	ne.	25	ne.	27	3	6	21	.....	2.0	T
Hawaiian Islands																																
Honolulu	38	86	100	30.00	30.04	.....	74.2	+1.2	83	18	78	66	6	70	13		66	62	68	1.44	−.7	12	10.6	e.	28	ne.	6	7	14	9	5.6	.0	.0

[1] Observations taken at airport.
[2] Observations taken hourly.
[3] Pressure not reduced to a mean of 24 hours.

TABLE 3.—*Data furnished by the Canadian Meteorological Service, April 1938*

Station	Altitude above mean sea level, Jan. 1, 1919	Pressure			Temperature of the air						Precipitation		
		Station reduced to mean of 24 hours	Sea level reduced to mean of 24 hours	Departure from normal	Mean max. + mean min. ÷ 2	Departure from normal	Mean maximum	Mean minimum	Highest	Lowest	Total	Departure from normal	Total snowfall
	Feet	*In.*	*In.*	*In.*	*°F.*	*°F.*	*°F.*	*°F.*	*°F.*	*°F.*	*In.*	*In.*	*In.*
Cape Race, Newfoundland	99												
Sydney, Cape Breton Island	48	29.95	29.99	+0.07	38.5	+3.0	46.8	30.2	66	18	5.28	+1.41	6.2
Halifax, Nova Scotia	88	29.76	30.03	+.10	40.7	+1.3	47.5	33.9	79	19	5.66	+1.11	4.1
Yarmouth, Nova Scotia	65	29.91	30.02	+.07	42.0	+2.1	49.3	34.8	63	21	4.61	+.92	11.1
Charlottetown, Prince Edward Island	38	29.94	30.02	+.10	37.8	+1.2	44.9	30.8	64	15	3.85	+1.16	5.4
Chatham, New Brunswick	28	29.87	29.99	+.05	38.4	+1.3	47.7	29.2	74	4	1.76	−1.25	7.1
Father Point, Quebec	20	29.93	29.95	+.01	33.8	+.2	39.7	27.8	65	8	2.01	+.04	2.3
Quebec, Quebec	296	29.66	29.99	+.03	40.5	+4.1	48.1	32.9	71	8	3.43	+1.01	8.1
Doucet, Quebec	1,236	28.63	30.00	+.01	32.8	+4.6	43.7	22.0	76	−4	4.48	+2.72	2.5
Montreal, Quebec	187												
Ottawa, Ontario	236	29.71	29.97	−.01	43.5	+2.0	52.2	34.8	83	14	3.19	+.91	4.1
Kingston, Ontario	285	29.69	29.99	.00	42.9	+1.7	50.2	35.6	72	18	2.44	+.11	11.5
Toronto, Ontario	379	29.60	30.02	+.01	46.2	+3.4	54.2	38.2	83	20	1.75	−.71	5.0
Cochrane, Ontario	930	28.94	29.98	−.06	31.1	−1.1	40.3	21.9	59	−1	4.50	+2.93	3.5
White River, Ontario	1,244	28.62	30.00	−.02	31.9	−.1	42.4	21.4	68	−8	3.37	+1.83	2.1
London, Ontario	808	29.14	30.04	+.02	45.0	+1.2	53.7	36.2	82	18	1.76	−1.06	5.2
Southampton, Ontario	656	29.28	30.00	+.01	42.1	+2.1	51.1	33.2	78	15	1.74	−.55	7.9
Parry Sound, Ontario	688	29.29	29.99	.00	42.4	+3.2	51.6	33.3	78	12	2.79	+.51	8.1
Port Arthur, Ontario	644	29.27	29.99	−.04	35.0	−.5	43.8	26.1	65	6	4.31	+2.87	4.8
Winnipeg, Manitoba	760	29.15	30.01	−.07	37.8	−.2	49.5	26.1	69	4	1.10	−.24	5.0
Minnedosa, Manitoba	1,690	29.18	30.04	+.03	36.0	−1.6	48.2	23.9	72	6	.48	−.68	2.4
Le Pas, Manitoba	860												
Qu'Appelle, Saskatchewan	2,115	27.70	30.00	.00	37.6	+.2	48.8	26.4	77	−2	.96	−.19	4.4
Moose Jaw, Saskatchewan	1,759	28.00	30.02	+.06	40.8	+1.5	52.3	29.3	77	3	.67	−.09	3.7
Swift Current, Saskatchewan	2,392	27.42	30.02	+.05	40.8	−.5	51.6	29.9	74	2	.49	−.33	.5
Medicine Hat, Alberta	2,365	27.46	29.98	+.04	43.2	−1.8	54.7	31.8	76	−6	.42	−.33	.3
Calgary, Alberta	3,540	26.29	30.01	+.06	39.2	−.7	50.2	28.1	67	10	.75	−.20	7.3
Banff, Alberta	4,521												
Prince Albert, Saskatchewan	1,450	28.46	30.06	+.06	37.1	+.5	47.8	26.4	75	1	.52	−.40	5.0
Battleford, Saskatchewan	1,592	28.25	30.03	+.05	38.0	−.2	50.3	25.6	73	−6	.23	−.39	1.8
Edmonton, Alberta	2,150	27.67	29.98	+.07	39.9	+.3	50.8	29.0	71	13	.45	−.46	4.4
Kamloops, British Columbia	1,262	28.69	30.07	+.11	51.7	+2.1	64.6	38.8	80	24	.16	−.25	.0
Victoria, British Columbia	230	29.80	30.05	+.02	50.0	+1.6	56.6	43.5	63	34	1.91	+.47	.0
Barkerville, British Columbia	4,180												
Estevan Point British Columbia	20	30.03	30.05	+.04	47.0	+1.7	52.6	41.3	57	35	5.59	−1.32	.0
Prince Rupert, British Columbia	170	29.68	29.88	−.06	45.0	+1.7	51.2	38.8	64	32	7.52	+.57	.0
St. George's Bermuda	158		30.14	+.09	66.9	+2.2	72.2	61.7	78	57	3.17	−1.18	.0
LATE REPORTS FOR MARCH 1938													
Cape Race, Newfoundland	99				25.0	−2.7	31.1	18.8	39	2	3.15	−.75	16.5

TABLE 4.—*Severe local storms, April 1938*

[Compiled by Mary O. Souder from reports submitted by Weather Bureau officials]

[The table herewith contains such data as have been received concerning severe local storms that occurred during the month. A revised list of tornadoes will appear in the United States Meteorological Yearbook]

Place	Date	Time	Width of path, yards	Loss of life	Value of property destroyed	Character of storm	Remarks
Trout, La	1	12:30 a. m.	800		$5,000	Wind, rain, and hail.	Buildings and roofs damaged; all crops and gardens complete loss.
Apalachicola, Fla., vicinity of	2	10:30 a. m.	100	0	300	Tornado	All trees fell toward the north and northeast; path 1½ miles long.
Wisconsin, extreme southern and southwestern portions.	5-6					Snow	This storm attained blizzard proportions. Much drifting interrupted highway traffic considerably.
South Dakota, southern half of State.	5-6			1		Heavy snow	Moist snow over a foot deep interrupted wire communication and closed schools. Due to poor visibility, a mail carrier was killed in a motor accident. On the 6th, in Des Moines, car service at standstill because of heavy ice-coated wires.
Iowa, central and northern sections.	5-8				100,000	Snow, sleet, and glaze.	This storm reported to be the worst of the winter. Mason City had 12 inches of snow. Roads blocked and communication disrupted. On the 8th strong winds drifted the snow, closing several highways in central Iowa. More than 100 automobiles stalled for 2 hours by drifts 4 to 6 feet deep. Northwestern Bell Telephone Co. reported the storm's damage to their lines over the State, one of the worst in history. Many towns cut off for hours. An estimate of 18,000 wire breaks and many poles snapped under the weight of heavy ice-coated wires.
Bunkie, La., vicinity of	6	Noon				Wind	Two persons injured.
Nebraska, southeast portion	6	Noon–midnight.	[1] 75		100,000	Glaze	Heavy deposit of glaze with fresh to strong winds; all communication lines disrupted. In northern and western Nebraska, blizzard conditions occurred at the same time. Path 150 miles long.
Wade, Okla	6	6 p. m.	[1] 3		20,000	Hail	Large hailstones damaged houses and other property and killed livestock; crop loss $10,000.
Mount Vernon and Mexia, Ala., and vicinities.	6					Tornadic winds and rain.	In Mount Vernon trees were blown across highways; telephone and power lines damaged. Many homes and several buildings at Searcy State Hospital damaged. In Mexia, 5 persons injured and 8 homes damaged.
Bertig, Ark.,[2] vicinity of	6					Rain	Several thousand acres of rich farmlands flooded. 100 families warned of danger, escaped. Water pouring through the levee break, widening rapidly to several hundred feet, uprooted large trees and swept away farm buildings.
Oakland, La., 9 miles east	6	10 a. m.	400	0	12,500	Tornado	8 persons injured; $10,000 damage to property; $2,500 crop loss.
Lincoln, Nebr	6-7	9:45 a. m., 6th–7:40 a. m., 7th.				Glaze	Thick coating of ice on all objects; much damage to communication lines.
San Antonio, Tex	6-7	7:28 p. m.			120,000	Wind and hail	Property damaged.
Whitley, Tippecanoe, and Delaware Counties, Ind.	6-7					Snow and ice	Transportation and communication temporarily disrupted; ice-coating on wires caused much damage.
Miami Valley, Ohio	6-7				7,500	Heavy rain and sleet.	Due to the rapid rise on all streams 11 roads were flooded and a bridge over Twin Creek washed out on the 7th; power and light service north of Dayton interrupted by sleet storm.
Chicago, Ill	6-8					Snow	9 inches of snow recorded; drifts 2 feet deep in some places; traffic delayed.
Wichita, Kans., and vicinity	6-8					do	This was the worst April storm, one of the most outstanding storms ever to visit this community. The snow was the heavist of record for April and the advanced stage of vegetation, 4 weeks ahead of normal, made the damage severe. All State roads blocked during the storm and for 24 hours afterward. Streets impassable for several hours, due to heavy drifting. Trains going east as much as 24 hours late. The delays were mostly to the southwest, in the Texas Panhandle and western Kansas. Loss to wheat crop estimated at 10 to 15 percent.
Amarillo, Tex	6-8					Snow, dust, and wind.	In many places snow and dust drifted with temperature that remained below freezing for 42 consecutive hours. Loss to fruit and wheat crops; stock died from exposure.
San Antonio, Tex	7	1:53 a. m.			60,000	Wind	Property damaged.
De Ridder, La	7	10:45 a. m.	[1] 3			Hail	Roofs, trees, and gardens damaged.
Fluker, La	7	Noon				Wind	Trees uprooted; roofs damaged.
Scott, Neshoba, Noxubee, and Lowndes Counties, Miss.	7	do			31,000	Tornadic winds	16 persons injured and propertydamaged; path narrow and short.
Douglasville, Ga., vicinity of	7	4 p. m.		0	30,000	Tornado	9 houses, a church, 5 barns, and outbuildings completely wrecked; other property damaged.
Greenville, S. C., vicinity of	7	8:20 p. m.			2,000	Thundersquall	52 trees blown down with damage to houses; path about 4 blocks wide and 5 blocks long.
Whitestone, Ga	7	10 p. m.		15		Excessive rain and flood.	Talona Creek rose with much rapidity and swept away a combination dwelling and store with 15 persons, 10 of whom were in 1 family.
Chattanooga, Tenn., and vicinity.	7	P. m.				Tornadic wind and rain.	Barns and garages demolished; houses damaged; trees uprooted; wires down. Highways blocked with debris.
Aliceville, Ala.,[3] and vicinity	7			10		Tornado, rain, and hail.	60 persons injured; houses wrecked and many persons injured.
Hiram, Ga., vicinity of	7			1		Tornadic winds	House and garage completely destroyed and other buildings damaged. A couple, whose house was destroyed, carried about 100 feet in the air and dropped, without injury, on soft ground.
Concordia, Kans	7					Rain and snow	Rain, freezing as it fell in the morning, caused ice to form on wires. 6 inches of snow fell during the day and by 6 p. m. blizzard conditions existed. Nearly all roads blocked; railroads far behind schedule and communication wires down.
Abilene, Tex	7					Snow and sleet	2.4 inches of snow, the heaviest snowfall recorded at this station, fell during this storm.
Topeka, Kans	7-8					Snow	6.5 inches of snow recorded; highways blocked by drifts.
Dodge City, Kans	7-9					Blizzard	Worst April blizzard of record. All streets in Dodge City, all roads and railroads from the city blocked, from the evening of the 7th until noon of the 9th; drifts from 8 to 10 feet.
Lansing, Mich	8	P. m.				Snow	More than 5 inches of snow recorded.
Lynchburg, S. C	8	do			11,000	Electrical	Cotton warehouse burned with loss of 696 bales of cotton.
Fairmont, Ga., vicinity of	8					Heavy rain	Heavy wash-outs that necessitated repairs to railroads and highways, including new bridge construction.
Grand Rapids, Mich	8					Snow	Traffic considerably hampered by heavy snow in the afternoon and early evening.
Columbia, Mo	8					Snow and sleet	Heaviest snowfall, 5.8 inches, ever to have occurred in April, recorded 8 p. m. this date. Snow preceded by heavy sleet for a short time.
Springfield, Mo	8					Rain, sleet, and snow.	2 inches of snow recorded. Streets and highways, locally mostly clear. In the late afternoon and early evening, a comparatively short distance to the west highways were completely blocked.
Buffalo, N. Y.[4]	8					Snowsquall	Light, dry snow fell during the morning disappeared before noon. Heavy moist snow beginning at 12:20 p. m., measured 4.8 inches in 24 hours.
Dallas, County, Tex.[5]	8				1,000,000	Hail	Hailstones reported to have been the size of baseballs. 13 persons injured hundreds of plate glass windows broken; traffic delayed; wire service interrupted and automobile tops punctured.
Blakely, Ga., vicinity of	8					Tornadic winds	Several houses and outbuildings blown down; 6 persons injured, 1 seriously.
Rochester, N. Y	8-9					Snow	6.5 inches of snow recorded, the second heaviest snowfall of the winter.
Benton, Ill.[3]	9			3		do	2 boys killed in a motor accident; woman fatally struck by a heavy gate.

See footnotes at end of table.

TABLE 4.—*Severe local storms, April 1938*—Continued

Place	Date	Time	Width of path, yards	Loss of life	Value of property destroyed	Character of storm	Remarks
Fergus Falls, Minn., and vicinity.	14	3 a. m.	1			Thunderstorm and hail.	Hailstones piled a foot deep in places. Season not far enough advanced for loss to growing crops. Storm moved from southwest to northeast over a path 3 miles long.
Antelope, Madison, Pierce, and Wayne Counties, Nebr.	14			1		Heavy rain and flood.	Railroad bridge and section of track washed out.
Plainville, Kans., 2 miles southwest.	15	7:50 a. m.	200	0	$12,400	Tornado	Storm moved from the southwest. 1 person severely injured; damage to farm property, telephone and power lines over a path 1½ miles long.
Elwood, Nebr.	15	10:30 a. m.	34	0		do	Tornadic cloud observed in open fields.
Eustis, Nebr.	15	11:05 a. m.	100	0	15,000	do	No details.
Gothenburg, Nebr., 3 miles west.	15	Noon	34	0	5,000	do	2 persons injured.
Winona, Minn.	15	4 p. m.				Thunderstorm and hail.	Ground completely covered with hail. No loss to growing crops, because of early season. Storm moved from west to east over a path 10 miles long.
Rocky Mount and Alden Bridge, La.	15	10 p. m.	100		650	Wind	Trees uprooted; barn and several outbuildings demolished; mule killed.
Kenton, Okla.	16	12:08 p. m.	[1] 10		1,000	Wind and dust	Windmills overturned, barns unroofed, and other buildings destroyed; heavy dust accompanied the storm. Path 10 miles long.
Mount Carroll, Ill., and vicinity.	16				2,000	Wind and hail	Property damaged. Loss from hail not estimated.
Eustis, Nebr.	16			0		Tornado	Several homes wrecked.
Baird, Tex., vicinity of.	17	4 p. m.	3–6			Hail	Severe damage over a path 12 miles long.
Stockton, N. J., vicinity of.	18	P. m.	7		2,000	Wind	Small buildings damaged injuring 2 girls; 2 brooder houses demolished; 10 large trees blown over.
Anthony, Kans., and vicinity.	19	9 p. m.	[1] 1		10,000	Hail	Roof of automobile tops damaged; path 1½ miles long.
Grand Rapids, Mich.	19					Wind	Considerable damage to trees and wires.
Burning, Nebr.	23	7:30 p. m.	300	0	500	Tornado	Property damaged.
Fort Worth, Tex.	23				55,000	Wind and hail	Property damage, $5,000; loss to crops, $50,000. Path 1 to 4 miles wide and 6 miles long.
Oshkosh, Nebr., 12 miles southwest.	26	2:15–3 p. m.	100	3	25,000	do	3 children killed and 6 persons injured in the wreck of a rural schoolhouse. 2 groups of farm buildings destroyed.
Two Buttes, Colo., vicinity of.	26	3 p. m.		0	6,000	do	3 windmills, 5 barns, house and 2 graineries and a garage destroyed; other property damaged; small livestock lost.
Stratton, Colo.	26	3:30 p. m.	1,320	0	700	Tornado and dust	Several small buildings wrecked. Porch torn from 1 house, a gable from another and 1 almost completely unroofed. Path a block long.
Tripp County, S. Dak.	26	4:15 p. m.			3,500	Heavy hail	Hailstones, size of marbles and baseballs, broke windows, damaged roof and automobile tops and killed fowl. Path narrow.
Manter, Kans., and vicinity.	26	5 p. m.	7	0		Tornado	Storm moved from the northwest. Several buildings damaged; path 5 miles long.
Hooker, Okla.	26	5:30 p. m.		0	10,000	do	Several buildings torn away; farm buildings unroofed and outbuildings damaged. Crop loss small; path 20 miles long.
Huron, Woonsocket, and Iroquois, S. Dak., and vicinities.	26	5:30–7:30 p. m.			42,500	Wind, rain, and hail.	High winds of tornadic force, accompanied by heavy rain and hail wrecked several buildings and blew down telephone poles from Iroquois to Woonsocket. Windows broken and several persons injured. In Huron cellars were flooded because sewers were inadequate for the excessive rainfall.
Lynn and Dawson Counties, Tex.	26	6 p. m.		3	30,000	Tornado	Storm moved from southwest to northeast. More than 50 persons injured.
Liberal, and Sublette, Kans., and vicinities.	26	6:10–6:45 p. m.	100	0	12,000	do	Property damaged. Path 1 to 2 miles wide and 30 miles long. Storm moved from south-southwest. Many buildings and automobiles damaged. Path 40 miles long.
Healy, Kans., and vicinity.	26	7 p. m.		0	500	do	Chief damage to small buildings; path not well-defined.
Dodge City, Kans., and vicinity.	26	7:20 p. m.		0	20,000	do	Storm moved from the southwest. Damaged confined almost entirely to rural districts; path narrow and several miles long.
Fowler, Kans., vicinity of.	26	7:30 p. m.		0	1,000	do	Storm moved from the southwest. Damage to farm buildings; path narrow and several miles long.
Trego and Graham Counties, Kans.	26	P. m.		0	25,000	do	Storm moved from the southwest. Damage to rural property; path 25 miles long.
Hartford, Conn., vicinity of.	27	1:36–2:48 p. m.			8,000	Thunderstorm	At Camp Toumey, near Goshen, Conn., about 15 C. C. C. boys were shocked and several burned. Large barn at Warren destroyed by fire.
Hamilton County, Iowa.	27	6:45 p. m.		0	3,000	do	Storm took a northeastward direction, cutting a narrow swath through an oatfield, demolishing a rural church.
Marshalltown, Iowa, 4 miles southeast.	27			0	4,000	do	Property damaged.
Springfield, Ill.	27				1,200	Thundersquall	Damage to trees, porches, and windows.
Brainerd, Minn., and vicinity.	27				27,000	Rain and flood	Sewers overflowed, flooding many basements; small house and garage undermined by rush of water, toppled 25 feet in a gully; short section of Northern Pacific track washed out.
Atkins, Ark., 6 miles south.	29	5:45 p. m.	440	0	1,500	Straight-line wind and hail.	1 person injured; barn destroyed and other property damaged; loss to cotton and corn crops.
Washington, D. C., and vicinity.	29				100,000	Hail	The hailstones were unusually large and of an unusual form. Damage to greenhouses $100,000. Small damage to skylights, windows, and automobile tops.
Michigan, southeastern portion.	29			2	150,000	Wind, electrical	Extensive property damage; trees and poles down. Amount estimated damage from fire.

LATE REPORT FOR MARCH 1938

Cerro Gordo, Franklin, Wright, and Mitchell Counties, Iowa,[2] and vicinities.	21	P. m.			50,000	Wind, hail, and electrical.	Many large trees uprooted; property damaged.

CORRECTIONS

Under Mar. 28, should be Feb. 28, 1938.	Feb. 28.						
Maugansville to Tangier Island, Md.	do					Gale	Chimney of a greenhouse blown down in Maugansville with $500 damage. Several fishing vessels blown on a sand reef over Tangier Island. A powerboat wrecked attempting a rescue. Poles in several sections of Anne Arundel County down.
Columbus, Kans., and vicinity.	Mar. 30.	10:50–11:15 a. m.	133	10	$575,000	Tornado	Should be: 150 persons injured; 180 residences and 88 buildings demolished or badly damaged. Damage at Columbus $500,000 and in Chetopa and Faulkner, $75,000. In table for March 1938 the entire damage given for Columbus, Kans., with no mention of Chetopa and Faulkner.

[1] Miles instead of yards.

[2] From press reports.

Chart I.—Departure (°F.) of the Mean Temperature from the Normal, April 1938

Chart I. Departure (°F.) of the Mean Temperature from the Normal, April 1938

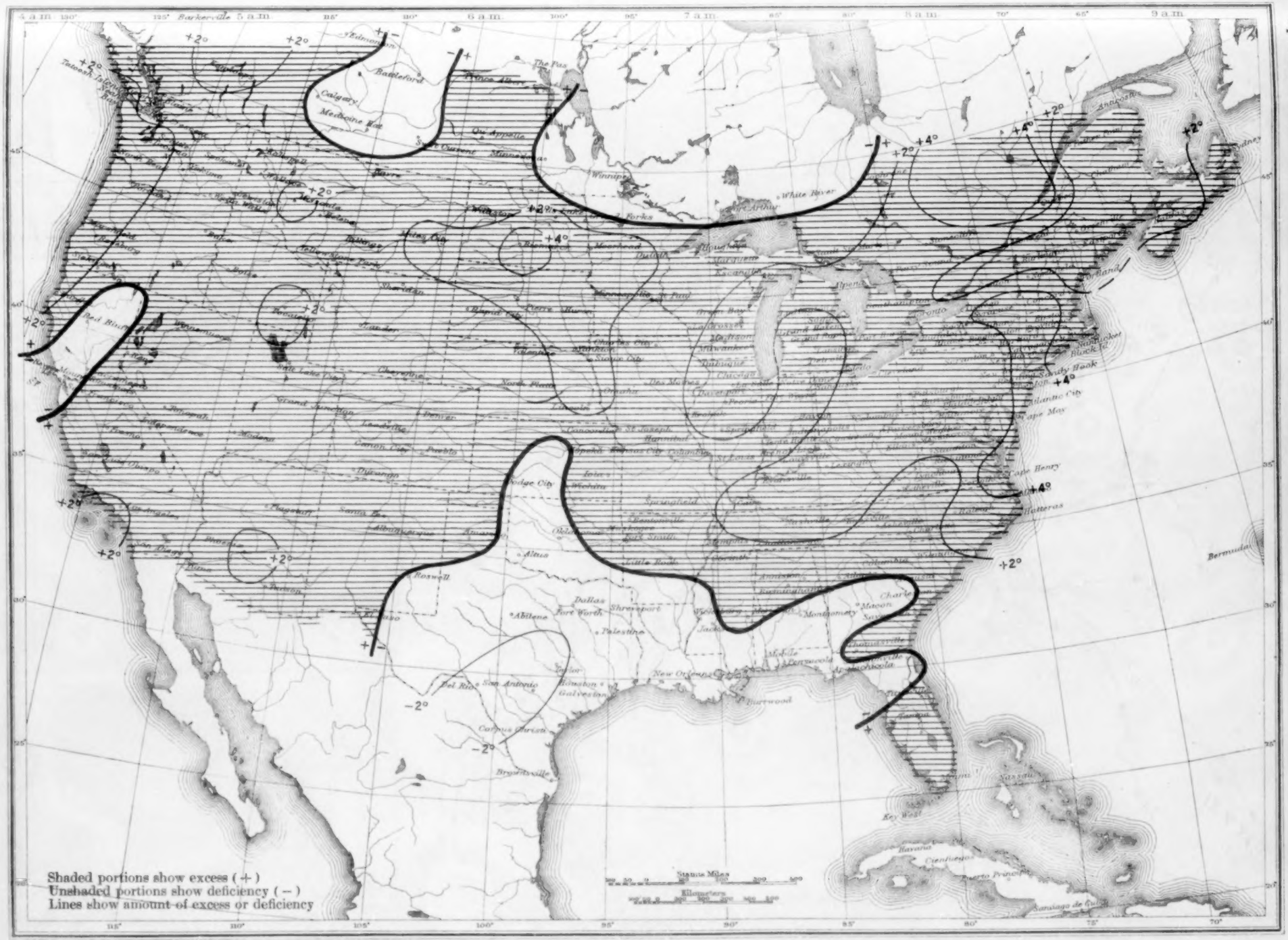
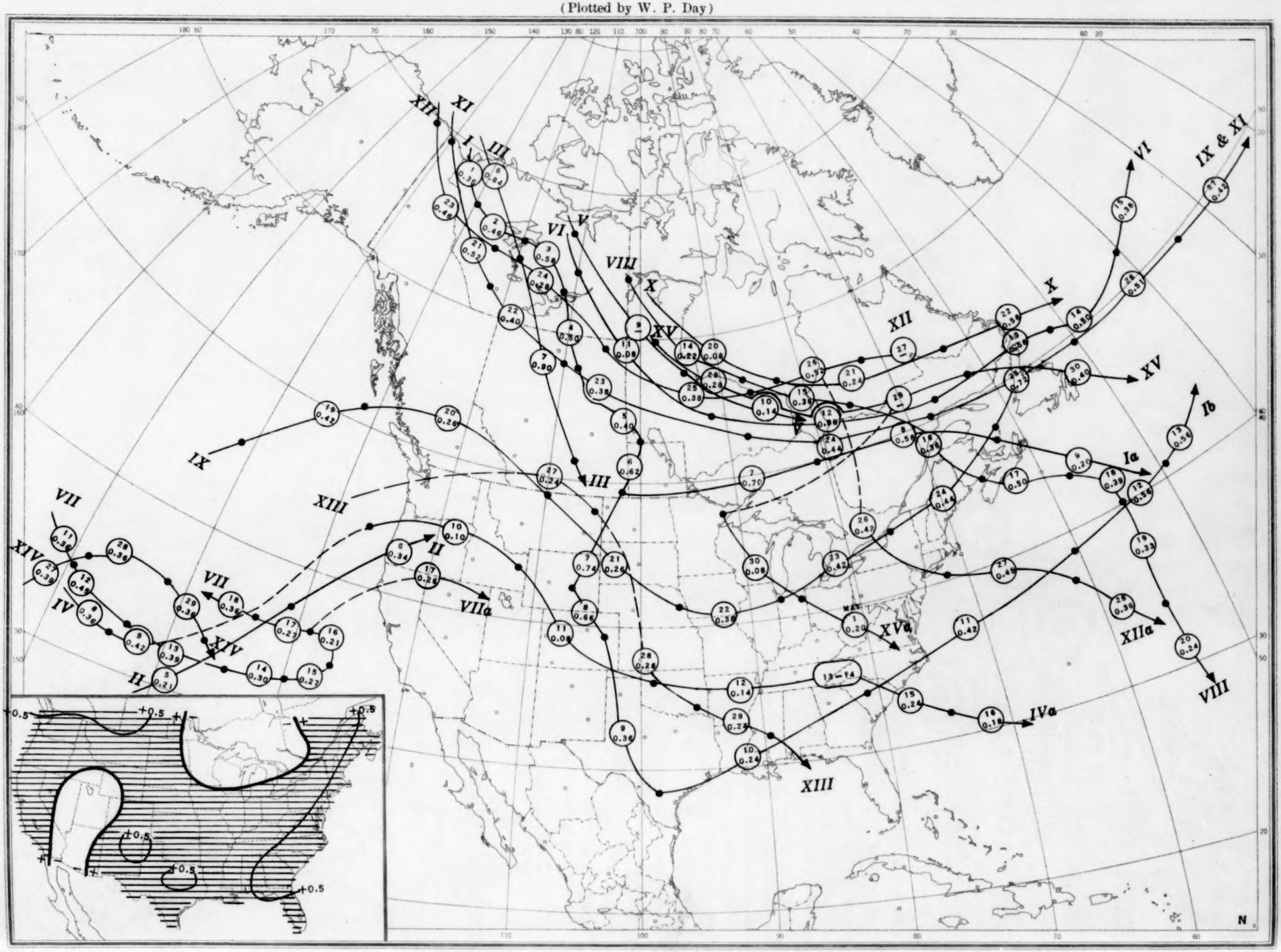


Chart II. Tracks of Centers of Anticyclones, April 1938. (Inset) Departure of Monthly Mean Pressure from Normal

(Plotted by W. P. Day)



Circle indicates position of anticyclone at 7:30 a. m. (75th meridian time), with barometric reading. Dot indicates position of anticyclone at 7:30 p. m. (75th meridian time).

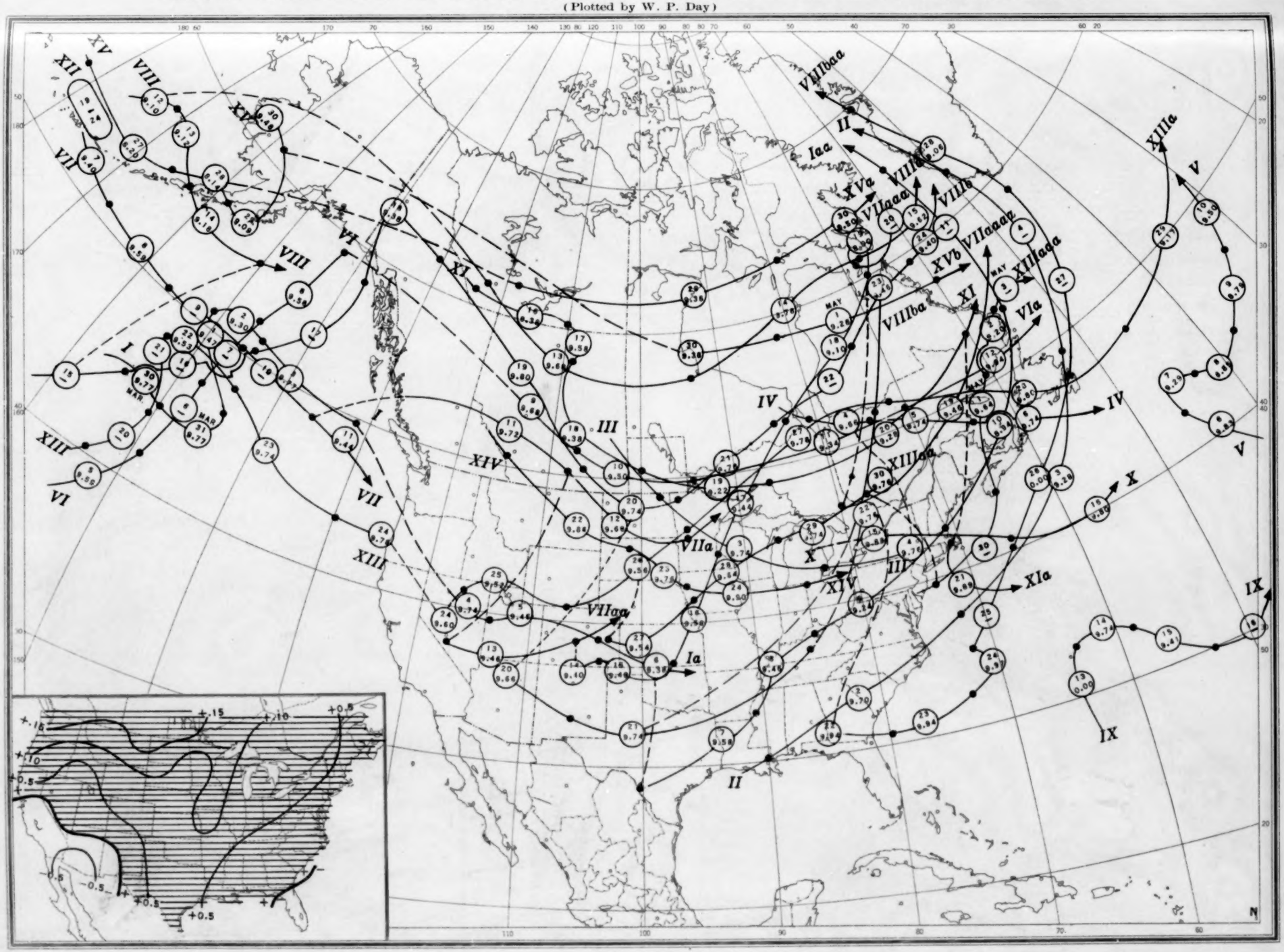
Chart III. Tracks of Centers of Cyclones, April 1938. (Inset) Change in Mean Pressure from Preceding Month

(Plotted by W. P. Day)

Circle indicates position of anticyclone at 7:30 a. m. (75th meridian time), with barometric reading. Dot indicates position of anticyclone at 7:30 p. m. (75th meridian time).

Chart III. Tracks of Centers of Cyclones, April 1938. (Inset) Change in Mean Pressure from Preceding Month

(Plotted by W. P. Day)



Circle indicates position of cyclone at 7:30 a. m. (75th meridian time), with barometric reading. Dot indicates position of cyclone at 7:30 p. m. (75th meridian time).

Chart IV. Percentage of Clear Sky Between Sunrise and Sunset, April 1938

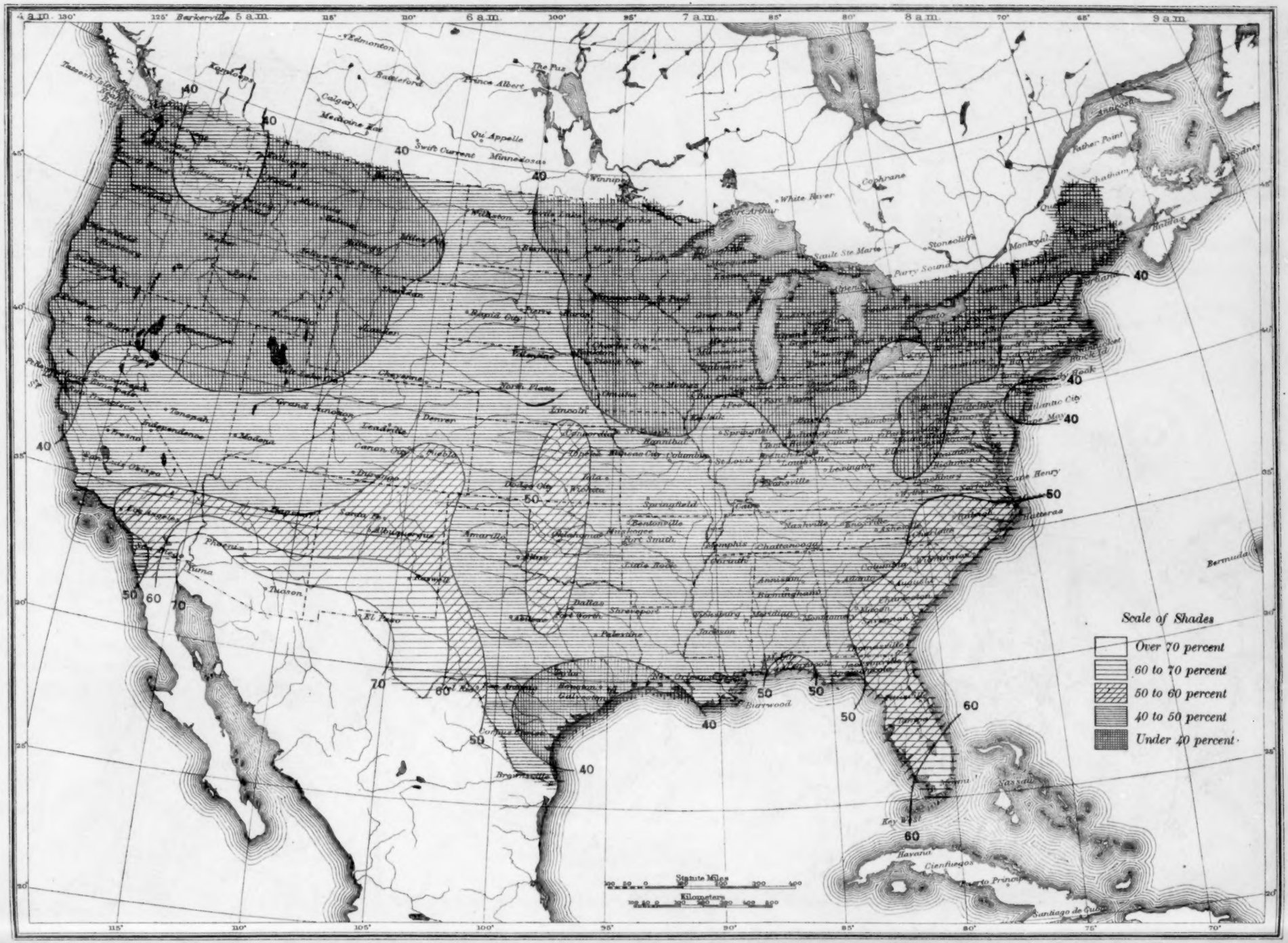


Chart V. Total Precipitation, Inches, April 1938. (Inset) Departure of Precipitation from Normal

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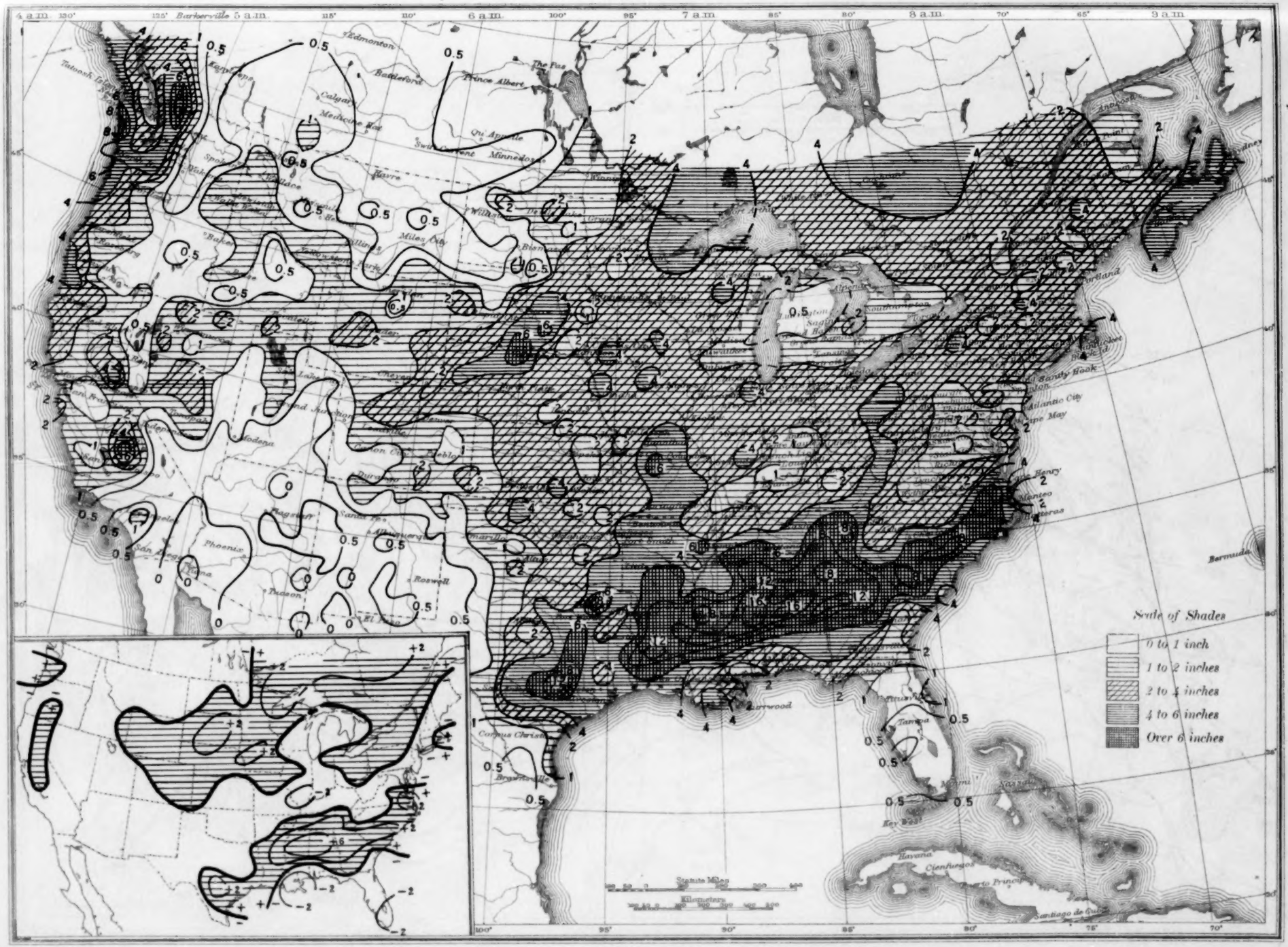

Chart VI. Isobars at Sea Level and Isotherms at Surface; Prevailing Winds, April 1938

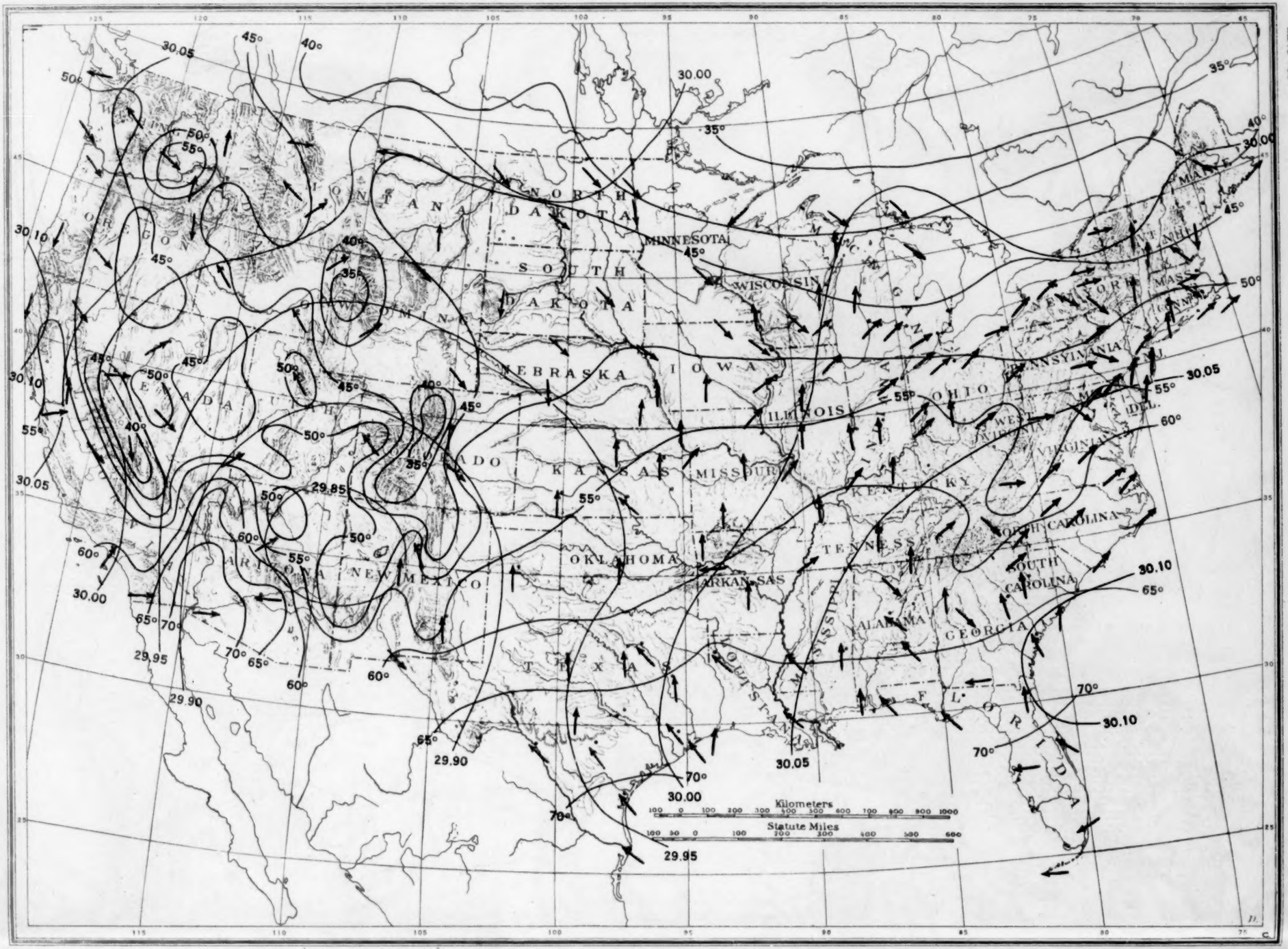

Chart VII. Wind Roses for Selected Stations, April 1938

(Plotted by W. W. Reed.)

Chart VII. Wind Roses for Selected Stations, April 1938

(Plotted by W. W. Reed)

Chart VIII. Total Snowfall, Inches, April 1938